

Unlined Production:
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Speed Press Work
PAGE 91

Air Conditioning
and Refrigeration
PAGE 101

The TOOL ENGINEER

Official Publication of
American Society of Tool Engineers

...Behind
THE WEAPONS
THAT WIN A WAR!



NEW BRITAINS



5th
WAR LOAN

EVERYBODY'S JOB TO GET BEHIND THE



NEW BRITAIN-GRIDLEY MACHINE DIVISION

MAKE YOUR DOLLARS FIGHT, TOO



The New Britain Machine Company • New Britain, Connecticut



PUBLISHED BY THE BRAMSON PUBLISHING COMPANY



Throughout the rush of today's war production — and for many peace-time years before that — Pratt & Whitney Roll Thread Snap Gages have done yeoman service wherever small threaded parts have needed accurate, rapid gaging.

The Roll Thread Snap Gage is an old story to Pratt & Whitney . . . we have made thousands of them . . . for every phase of industry.

THROUGH ALL THE RUSH This Vital Service Has Not Changed

ACCURACY cannot be rushed . . . not the kind of accuracy that Pratt & Whitney has supplied to industry these past 83 years.

We know full well the desperate pressure and rush of war production . . . we've served faithfully through many of our country's wars. But never in any of these emergencies has the Pratt & Whitney standard of accuracy been sacrificed for speed. Enlarge our facilities . . . yes. Add and train thousands more men . . . yes. But lower our standard of accuracy . . . never. Through peace and war, Pratt & Whitney machine tools, small tools, and gages are made to one rigid standard of accuracy which has never changed.



PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT



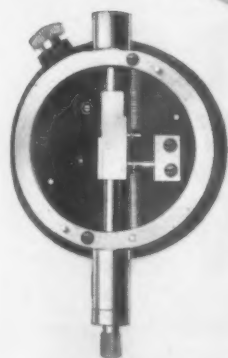
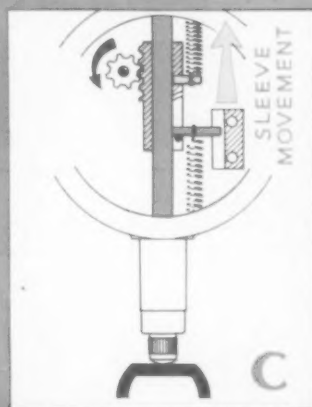
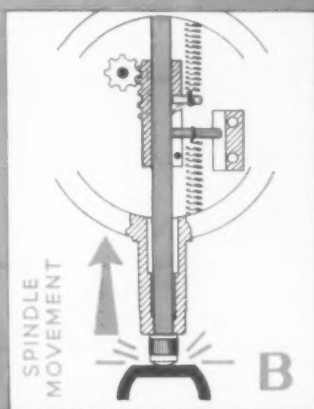
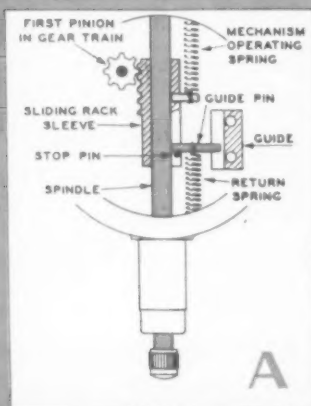
STANDARD

SHOCKPROOF *Dial Indicators*

Here's How The SHOCKPROOF Action
Protects the Precision Mechanism



22 MILLION BLOWS,
struck deliberately on a stock gage,
failed to damage gear teeth, bear-
ings or spindle, or impair the instru-
ment's accuracy.



Rear view of SHOCKPROOF
Dial Indicator, cover re-
moved, showing "Free Wheel-
ing" mechanism.

- A — Rest Position
- B — Sudden blow or contact by work piece raises spindle. For an instant guide pin moves away from contact with stop pin. This allows mechanism operating spring to raise the rack sleeve which is slidable on the spindle.
- C — Stop pin and guide pin resume contact after the mechanism operating spring has actuated the gearing. Relative position of spindle and rack sleeve is restored.

In actual use only the more sudden shocks against the contact point jar the spindle ahead of the rack sleeve. For normally applied contacts the sleeve and spindle move together as a unit. In any case the force on the mechanism is never any greater than the pull of the spring.

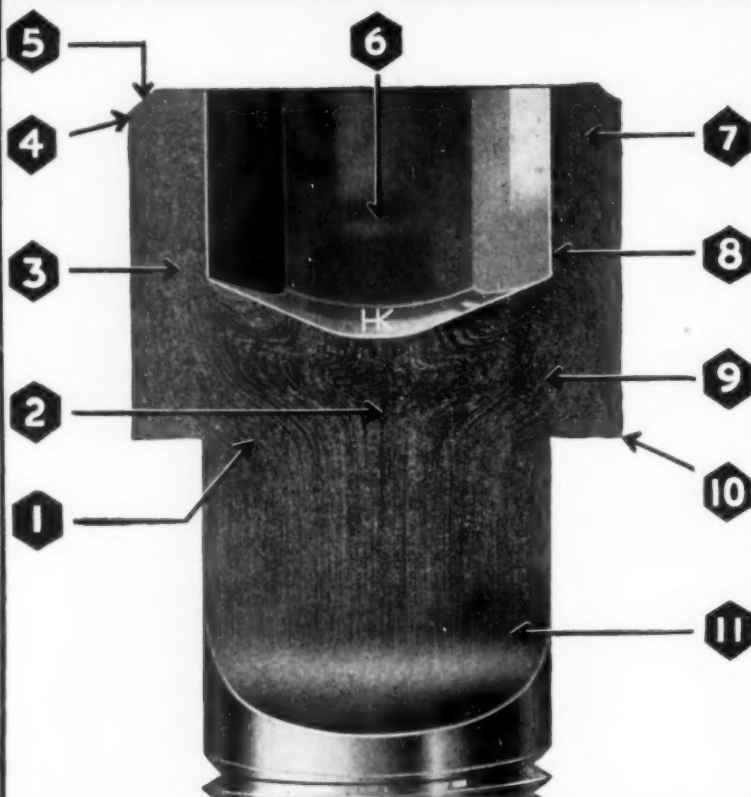
WRITE FOR COMPLETE CATALOG



STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

Completely Cold Forged

EXCLUSIVELY HOLO-KROME



OUTSTANDING FEATURES

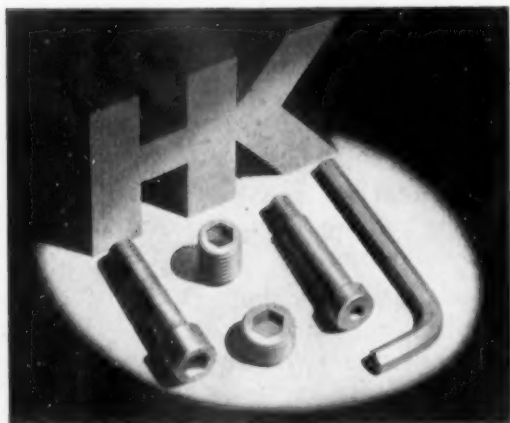
- 1- Increased Strength.
- 2- Continuous Uncut Laterally Deflected Core Fibres.
- 3- Continuous Unbroken Fibres.
- 4- Smooth Flat Top With Slight Chamfer.
- 5- Concentricity of Head With Body.
- 6- Sockets - Uniformly Accurate to Full Depth of Hole - True Hexagonal Shape - Across Flat Section Diameter Identical Top and Bottom - No Taper - Smooth Regular Walls - Well Defined Corners.
- 7- Continuous Fibres Ending in Socket Walls.
- 8- Re-enforced Socket Walls.
- 9- Continuous Uncut Fibres.
- 10- Square Shoulders.
- 11- Original Continuous Fibrous Structure.

UNRETOUCHED PHOTO ETCHED CUTAWAY
HOLO-KROME SOCKET HEAD CAP SCREW

Method Patented, Owned, Controlled
and Used Solely by HOLO-KROME

TRADE
MARK

HOLO - KROME
FIBRO FORGED



**SOCKET
SCREWS**

Precision Made — Completely Cold Forged — the results of the Holo-Krome patented method . . . NOTICE the Continuous Fibres Originating in the shank of the Screw (11), continuous uncut, unbroken around the bottom of the Socket (2) between it and the shoulder of the Screw (9) and terminating in the Socket Walls (8). Exclusively Holo-Krome! It's the method that achieves the results. Specify "Holo-Krome".

GUARANTEED UNFAILING PERFORMANCE

THE HOLO-KROME

— SOCKET SCREW PRODUCTS —
SCREW CORP. HARTFORD 10, CONN. U. S. A.

THE TOOL ENGINEER

T.M. REG. BY AMERICAN SOCIETY TOOL ENGINEERS

THE BRAMSON PUBLISHING COMPANY

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Publisher's Letter

WRITING this from Los Angeles, where we came to conduct another in our series of the "PRODUCTION Round-Table", I must tell you that this West Coast area really is up and coming—production-wise.

While the Coast probably has felt, more than any other section of the country, the tremendous stimulus of the war, nevertheless I believe that many permanent production improvements, methods and new processes have been developed out here that will make production veterans of the East and Midwest sit up and take notice.

To anyone viewing the West Coast picture for the first time, there are a few imponderables. Many things are "just different". We have been prone to think of the Southern California industrial area as primarily aircraft production and nothing else.

Actually, there are hundreds of

small (and some aren't so small) metal working plants engaged in the production of a great diversity of products.

You hear of many unusual things being done here—an internal combustion engine, for instance, produced entirely from stampings.

Heard, too, that when peace comes, the large aircraft plants will make under their own roofs the things they now "farm out". This will mean that even with greatly curtailed production of planes, a substantial part of their war-time employees may be retained.

Ambitious plans are in the offing to provide employment for the vast influx of war workers who are determined to stay.

Also learned that one sizable engine manufacturer is planning to buy almost 100 per cent new machine tool equipment for his post-war needs. He says, "We've learned too much about precision work to

monkey 'round with 'obsolete' equipment", and that "quality is going to be better, but production costs will be cheaper—after the war."

One complaint I hear, and surprisingly so, is that production engineers out here on the Coast have difficulty getting repair parts, or finding exactly what to order when a machine tool breaks down. "We can't get adequate literature on the subject," one executive stated.

If you are interested in post-war trends in manufacturing methods here as visualized by California engineers themselves, I recommend this month's "PRODUCTION Round-Table" (page 67).

To our Southern California hosts, Art Dennis along with the many others who treated us so well, go sincere thanks.

Now, we're heading for San Francisco, Portland and Seattle.

Cordially yours,

Roy T. Bramson

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ANOTHER EXAMPLE OF
BARBER-COLMAN
 HOBGING MACHINE PERFORMANCE

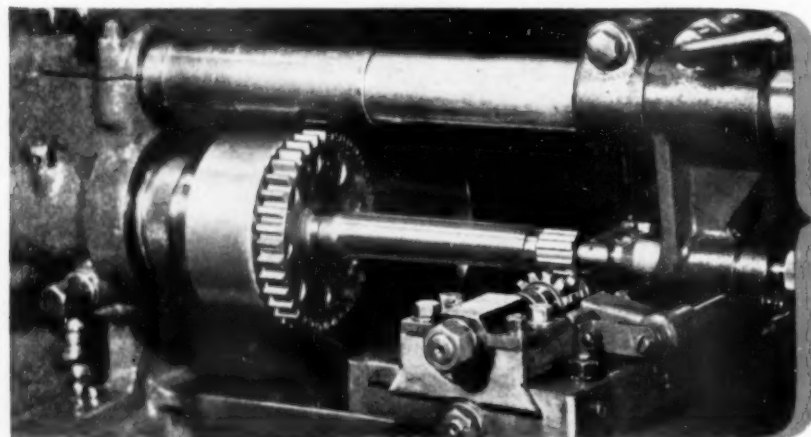
No. 3 HOBGING MACHINE

The machine used on this job is a standard Barber-Colman No. 3 Hobbing Machine — a general purpose machine of consistent accuracy for small or large lots of spur or helical gears, splines, and other hobbled forms. On this job the operator has added two indicators, one on the upright and one on the overarm support, to help in checking absolute parallelism on the finish cut.



ACCURATE SPLINES for STARTER GEAR

The operation shown here is hobbing splines on one end of an aircraft Starter Gear Shaft. The material of the shaft is SAE 6155 with a hardness of 250-275 Brinell. *Good finish is required, tooth thickness of each key must be held within .002", and maximum allowable runout is also .002".* Two cuts are taken, first a roughing cut, followed by resetting for depth and a finishing cut. The six keys are .970" long with an outside diameter of 1.165".



40 per 10 hr. SHIFT

Set-up and hob data for this job are;

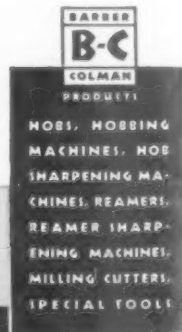
Feed per rev. of work, roughing..... .015"
 Feed per rev. of work, finishing..... .018"
 Hob speed.....157 r.p.m.
 Floor-to-floor time.....13 min.
 Production, per 10-hr. shift.....40 pieces
 Hob...1 7/8" O.D. x 1" length x 3/4" straight hole, ground, SINGLE POSITION type.
 No. of settings...1 only, for single pos. hob.
 Pieces per grind.....approx. 20
 Spline dimensions.....1.165" O.D., .986"/.982" R.D. 6 Keys—.249"/.247".

SINGLE-POSITION HOB USED

This job required a sharp root corner (.005"), and called for a single position hob. The distinguishing characteristic of this hob is that it has only one full-formed finishing tooth, all others being graduated, semi-finishing teeth.

Barber-Colman Company

GENERAL OFFICES AND PLANT • 105 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.



THE TOOL ENGINEER



TODAY'S HIGH PRODUCTION PRECISION MILLING BEGINS WITH MOTOR POWER



**MEANS EVERY
MILWAUKEE MACHINE
IS POWER ENGINEERED
TO DO THE JOB**

Milwaukee PowerRated Milling Machines
• Standard Models—Horizontal, Vertical and Bed Types — available in Motor ranges from 3 to 25 HP. • C.S.M. (Carbide Steel Milling) machines 20 to 50 HP. • Special Machines—Consult K&T engineers

In years past it was customary to purchase milling machines by range . . . depending on the size of work to be handled. The motor power was given insufficient consideration by most purchasers. For example, a model 2 machine with 3, 5 or 7½ hp. served practically all requirements in those days.

Today, however, with the constant changing of milling techniques, range is not the first consideration—hp. becomes the *number one factor* . . . the *starting point* when purchasing milling equipment. No machine which is engineered to handle work requiring from 3 to 7½ hp. can be expected to stand up very long if 15 to 20 hp. is substituted on the spindle.

You can always be sure that a Kearney & Trecker "Milwaukee" is correctly designed in terms of motor power, from the drawing board stage on through to the completed machine. Milwaukee Milling Machines are power-engineered — **POWERATED** — designed and built in keeping with their hp. range plus the normal overloads encountered within their field of job applications.

The next time you need milling equipment, think in terms of motor HP. for heavy cuts — range for light cuts. Consult a Kearney & Trecker field engineer. Explain to him the types of jobs which you intend milling. He will help you in deciding what PowerRated Milwaukee Milling Machine is best suited to your specific needs.

Back the Attack — BUY MORE BONDS

**KEARNEY & TRECKER
CORPORATION**

MILWAUKEE 14

WISCONSIN



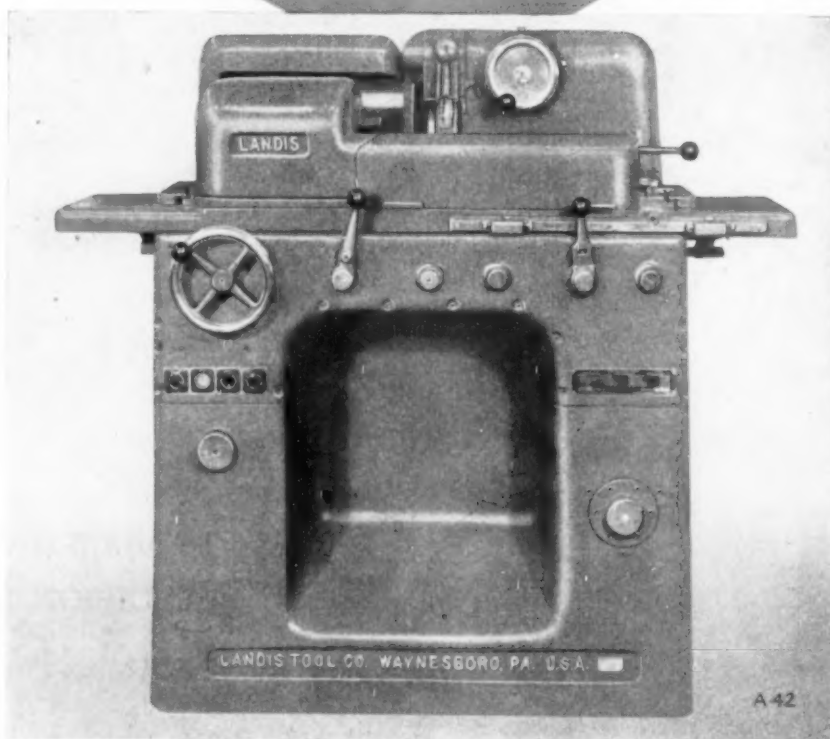
Milwaukee Machine Tools



TO FINISH THE JOB QUICKER . . .

THIS LANDIS PERFORMS

4300
OPERATIONS IN
10½ HOURS



*Unusual
Performance
As Usual*

Are tap manufacturers working at top speed? Just ask any of them and the answer will be a loud "YES".

If you ask a certain one, he will in addition undoubtedly point out the manner in which Landis 4" Type H Plain Hydraulic Grinders are helping meet the abnormal demands for his product. One of these machines is actually performing 4300 operations in

10½ hours. This, we submit, is a quite unusual record.

No grinder not properly designed and skillfully handled could even approach such productiveness. The Landis Type H has what it takes, as evidenced by performance in this plant and in many others. Are you certain that you have what it takes in your Grinding Department to turn out the smaller parts at the rate demanded today? If not, try the Type H.

LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA.



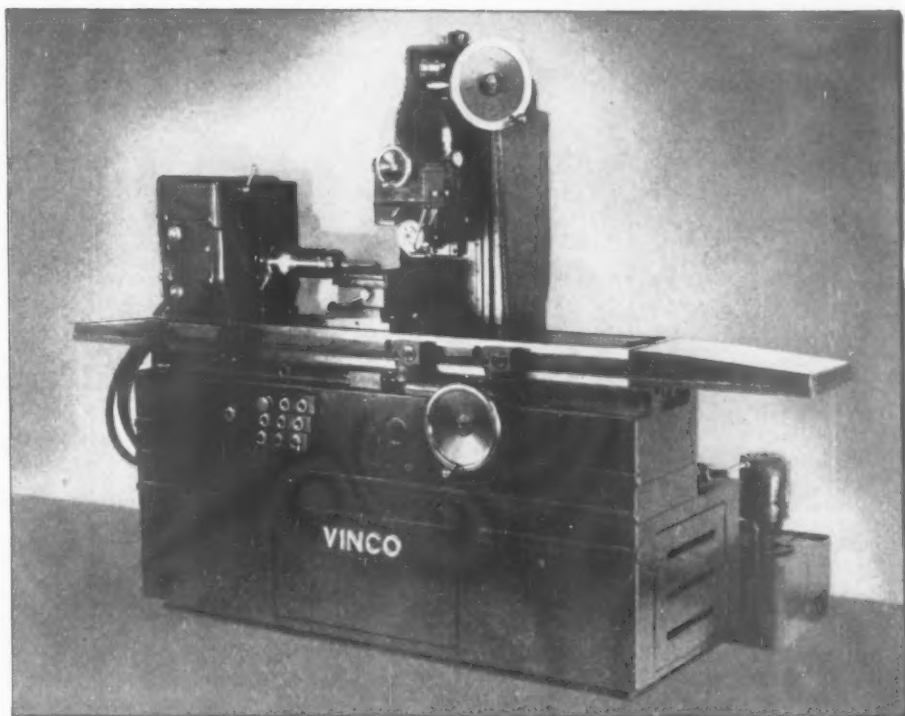
VARIABLE
VOLTAGE
HEADSTOCK.



MICROSPHERE
WHEEL SPINDLE
BEARINGS.



MICROMETER
WHEEL FEED.

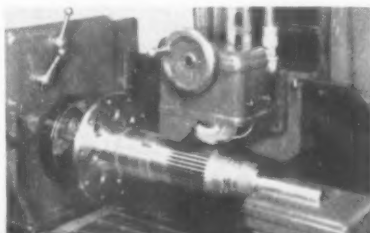


VINCO SPLINE & GEAR GRINDER

Here is a grinder that can safely be termed "super". Semi-automatic, hydraulically controlled, it does a fast, accurate job of grinding splines and gears in production. Wheel dressing and wheel feeding are the only non-automatic operations, and the only adjustment necessary is to compensate for wear of the dresser diamond. Its high degree of accuracy is due to a number of exclusive features—chief of which are the index head and plate, the index spindle, the wheel spindle and the Hydraulic Controls. The work, when indexed, instead of coming to an abrupt stop, is slowed by hydraulic action in the index head and the pawl drops gently into the slot of the master index plate. The plate is made with gage accuracy, being guaranteed accurate to within .0003" accumulated error. The index spindle is mounted in special ball

bearings and so closely fitted that there is no radial play or end play. The wheel spindle is driven by belts from a motor mounted in the column. Hydraulic "Feed and Deceleration" valves control the table which is slowed to a stop at each end of the stroke, thus preventing any jar. Similarly, its return is gradually accelerated for the first 1½" of stroke. Through our pressure regulator, practically constant pressure is maintained and uniform rate of feed accomplished. Automatic timing and synchronization of

all movements is a tribute to the engineering skill behind this exceptional machine tool. Write for specifications.



VINCO CORPORATION
8857 SCHAEFER HIGHWAY
DETROIT 27, MICHIGAN

MILLIONTHS OF AN INCH FOR SALE BY **V I N C O**

NORTON ABRASIVES



"Hard Arkansas"

That little oilstone, only three and a half inches long and one half inch square, costing 70 cents, is certainly earning its keep . . .

The Job: Machining to size, a boss on a magnesium casting. Cut .150 on first side, .250 on the opposite side; 24 hour continuous operation.

The Report: "With regular grinding, 67 parts were machined before failure of the milling cutter. We then stoned the same cutter by hand with a 'Hard Arkansas.' This increased production to 280 parts."

(Multiply that by the numbers of your machine cutters.)

"Hard Arkansas" is a natural stone from the Ozark Mountains, white as alabaster and unapproached in its faculty of imparting superfine edges.

For other hand-stoning jobs India Oilstones (aluminum oxide) are available in three grits and, like the Hard Arkansas, in hundreds of shapes and sizes.

Personal service by our Field Engineers and by the able men of our many Industrial Distributors merely awaits your call.

BEHR-MANNING

(DIVISION OF NORTON COMPANY)

TROY, N. Y.



NORTON ABRASIVES

BRANCHES: Boston, Buffalo, Chicago, Cleveland, Cincinnati, Grand Rapids, High Point, Indianapolis, Detroit, Los Angeles, New York, San Francisco, Philadelphia, St. Louis, Tacoma.

THE TOOL ENGINEER

There are many GOOD THINGS



AHEAD...

Fins applied to the sides of aircraft tires have been found to reduce wear. When the landing gear is lowered, the air pressure spins the wheels and reduces the scuffing of the tires in their first contact with the ground.

A new ignition cable is made of monel and is insulated with synthetic rubber and glass fabric.

Pure tungsten can now be produced directly from the ore by a newly reported electrolytic process.

A patent assigned to a large truck manufacturer permits the conversion of a regular truck to a half-track crawler.

The Office of War Information has an exhibit of new materials, methods, and products in the Social Security Building in Washington.

Echo sounders, intended to measure the depth of water under a ship, are being used to locate schools of fish.

Experiments are being made with alloys of wrought iron and nickel.

Machinery has been designed for the high-speed, mass-production baking of bread with infra-red lamps.

Neon lights will be standardized in 98 colors.

Several manufacturers of air-conditioning equipment are working on plans for a \$1,000 unit suitable for a six-room house.

At least 30 aircraft parts of laminated plastic paper are in production.

Lamp bulbs are being made shatterproof by a coating of lacquer.

A new double-barrelled spray gun that can handle two fluids at once has just been patented.

A novel mail box answers audibly any spoken request for the zone number of any address in the city.

The formerly worthless scrub palmetto, which grows like a weed on the Gulf Coast of Florida, is now ready to supply material for wall-board, brushes, binder twine, upholstery, insulation, and for use as a reinforcement for plastics and Portland cement.

A plastic molding powder is being made from potato starch.

Some engineers foresee the time when the refuse of cities—garbage, ashes, paper, etc.—will be removed continuously by underground tubes and burned in large incinerators to furnish power.

Shells are being tested by a new variation of the old trick of dropping a coin on the counter. When dropped on metal plates, the perfect shells make a particular sound that is detected and reported by an electronic "ear".

A fine finish may be put on stainless steel inexpensively by means of a newly patented electrolytic process.

The strength of spot-welded aircraft joints is being successfully tested by X-ray.

Because of its peculiar stretch and slow recovery, as well as its light weight and resistance to rot, Nylon rope is expected to have many post-war uses where a shock absorbing effect is required.

A new flexible tubing is made of woven glass fiber covered with plastic.

A new street cleaner sucks up leaves and compresses them for fertilizer.

When you look ahead Look at metal cutting costs



This part was produced on an 8 Spindle Conomatic from SAE 4615 seamless tube stock. The 16 machining operations, performed without rehandling, include hole and groove burnishing, threading, and internal recessing. Time—37 seconds. Conomatics cut metal cutting costs.



CONE

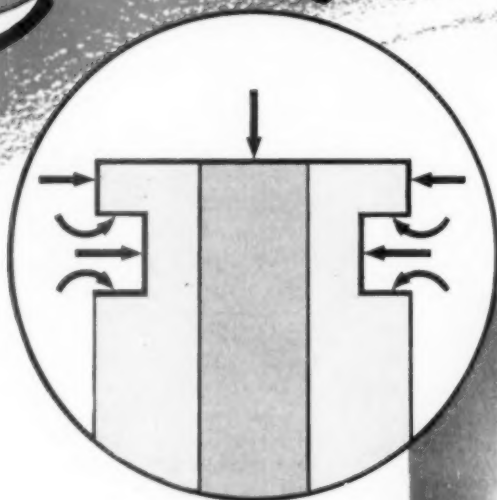
AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

Change to Broaching

ONE BROACHING MACHINE

Replaces

SIX MILLING MACHINES



The drawing above shows the broached contour of the part in the photograph at the right. These nine surfaces are cut in one pass on a horizontal broaching machine. No other machining process can duplicate this performance.



DETROIT BROACH COMPANY designed and built tools and fixtures for broaching the automatic pistol frame shown above. The operation had formerly required six milling machines and six operators plus the extra handling. Broaching requires only one machine and one operator thus providing greatly increased production per man and machine hour. Accuracy is improved considerably and production costs are much lower. ¶ There are many places in every shop where a change to broaching will increase efficiency. Broaching provides the advantages of great accuracy, high production speed and low cost due to extremely long tool life. Look over your own production processes and note where broaching might help you. Then call Detroit Broach Company. Our competent broach engineers will furnish you with complete cost and production data for your particular requirements. You will not be obligated, of course.



DETROIT BROACH COMPANY

20201 SHERWOOD AVENUE

9308 SANTA MONICA BLVD.

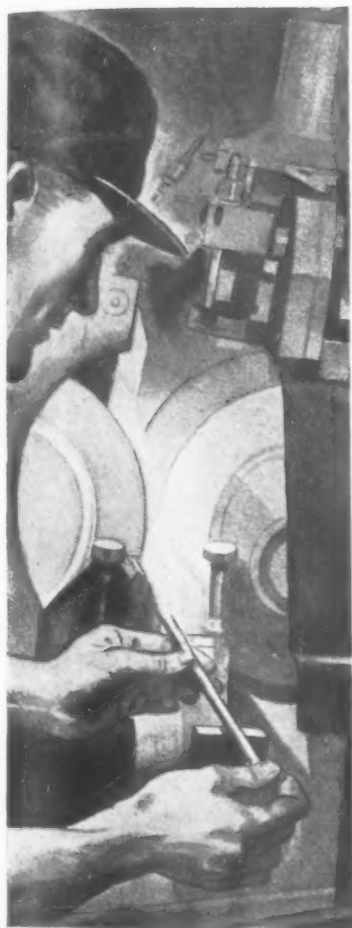
DETROIT, MICHIGAN

BEVERLY HILLS, CALIFORNIA

DESIGNED TO DO A BETTER WAR JOB

THE NEW NO. 277 SAFETY WHEELS

FOR NATIONAL EMERGENCY STEELS



NOW there is a grinding wheel designed specifically for centerless and cylindrical precision grinding of National Emergency Steels. It is the No. 277 Safety Wheel... with a NEW BOND that guarantees faster grinding—improved cutting action—better finish. Breaking and chipping has been reduced to a minimum—latitude of operations increased. Efficiency, economy, and production reach new high levels. And more and better war weapons flow to our fighting forces overseas. No. 277 wheels are made in almost every conceivable size, shape, grit, porosity, and grade of hardness. Whatever your grinding requirements—there is a specific No. 277 Safety Wheel to do the job. Write today for illustrated folder and full details.

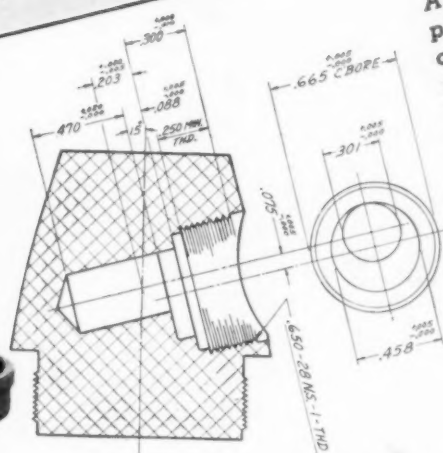
THE SAFETY GRINDING WHEEL AND MACHINE COMPANY

Main Office and Factory SPRINGFIELD, OHIO, Phone 4651

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| ● SALES OFFICE | ★ SALES OFFICE and WAREHOUSE | | |



Another APPLICATION OF THE LeMaire No. 10 Standard VERTICAL DRILLING MACHINE



A typical
performance
on this
machine.

Part is
completely
drilled,
reamed,
counterbored,
and tapped in
one cycle of
machine.

This LeMaire Standard Vertical Drilling Machine lends itself to many applications. Here the standard Twin Ram Unit is equipped with a multiple head carrying 10 spindles for drilling, rough and finish counterboring, and tapping. (Tapping spindles are an auxiliary attachment in the head.) All these operations are performed in one cycle of automatic index table having 5

working stations and 1 loading station. The machine produces 300 pieces per hour, net. The detailed diagram enables you to determine how adaptations can be made to your requirements. Standard vertical machines are available in three sizes—3 to 15 H.P. Standard horizontal machines are available with units up to 20 H.P.

Consult us NOW regarding your
postwar plans in production.

BUY
WAR BONDS

LeMaire TOOL & MFG. CO.

2663 S. TELEGRAPH ROAD  DEARBORN, MICHIGAN
ENGINEERS AND BUILDERS OF PRODUCTION MACHINES

*Easy
Operation
of*

P & J

AUTOMATICS

... assures
maximum production
with minimum
"woman-power"...



Adaptability of P & J Automatic Chucking and Turning Machines to operation by inexperienced workers has made it possible to employ many women as operators on these machines. Thus the manpower problem is being met and solved and production maintained at maximum in speed and accuracy. Shown here is one of the many women

employees in a well-known plant which produces a wide variety of small parts for the aviation industry. An entire battery of P & J 4D Automatics is handled by this female operator. Because of ease and convenience of operation, women and girls quickly learn to handle P & J Automatics skillfully and productively.



Hasten V-Day by making every Pay Day a Bond Buying Day

The POTTER & JOHNSTON MACHINE CO.
Pawtucket, R. I.



Photos Courtesy Consolidated Vultee

CONSOLIDATED VULTEE

...Cradle of the 'Liberator'...

USES 13 MOORE JIG BORERS IN THE LINE

○ ○ ○ The first two machines of this battery of thirteen entered the San Diego Consolidated plants in the late fall of 1939. In the first four months of 1941, six were added, and the following year five more joined the line. There is no better proof of jig borer satisfaction than a service record such as this, with a producer for whom performance *only* counts...performance such as: **RANGE:** In the boring of holes in jigs, fixtures, dies, gages and special, accurate machine parts, the Moore Jig Borer is highly sensitive for holes of 1/32" diameter, yet rugged for heavy cuts up to 4 1/2". The Moore Jig Borer is fast, accurate, versatile and rugged. **TOLERANCES:** Consistently .0002" and better. **COORDINATE LOCATION:** By the Moore system of coordinate location, attainable through lead screws ground to an accuracy never achieved before, the operator spots, drills, reams and bores in one uninterrupted sequence.

Partner in Production... The only machine tool of its kind, the Moore Jig Grinder corrects and finishes jig-bored holes on both hard and soft work within .0001". Let us show you how the Moore Jig Borer and the Moore Jig Grinder will modernize your toolroom operations for better war...and post-war...performance.



MOORE SPECIAL

TOOL COMPANY INC.

740 UNION AVENUE, BRIDGEPORT 7, CONN.

SEVERANCE CHATTERLESS COUNTERSINKS GIVE MIRROR FINISH..

If your production calls for perfectly finished seats, you simply can't beat Severance Chatterless Countersinks. In a few seconds, they produce a finish that will stand up to a commercial ground job. Using a standard type, a finish sufficiently smooth for valve seatings may be obtained. Because of their staggered tooth design, they take clean, shearing cuts — thereby eliminating chatter. Available with any angle and in a wide variety of diameters, lengths and shanks. Heavy duty types have tang shanks and may be used with a Glenzer sleeve. Write today for complete facts about how Severance Chatterless Countersinks can solve your counter-sinking problem.



Severance Midget Milling Cutters and special cutting tools of many types are available, with Severance tooth design, for finishing every kind of wood, plastic, metal and alloy. These fast-working tools take sharp bites, throw off clean chips. For best service, order new cutters and send your worn cutters for regrounding to the nearest Severance plant.

Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING • SEVERANCE TOOL INDUSTRIES INC., SAGINAW, MICHIGAN • PLANTS IN LONG ISLAND CITY 1, NEW YORK; DETROIT 2, MICHIGAN; FORT WAYNE, INDIANA; CHICAGO 6, ILLINOIS; AND LOS ANGELES 21, CALIFORNIA. IN CANADA: 60 FRONT STREET WEST, TORONTO, ONTARIO.

KEEPING TUBE ROLLS

True to Form

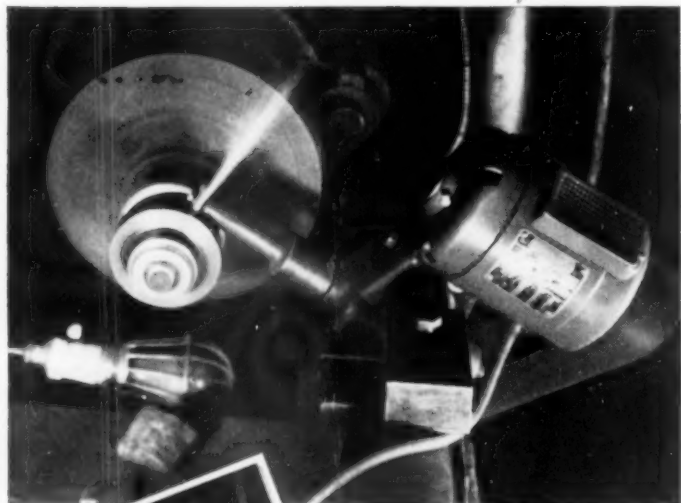


DEMONSTRATES THE ADAPTABILITY OF A DUMORE PRECISION GRINDER

Welded steel tubing produced by a certain midwest mill is used for various purposes necessitating precise and uniform outside diameter. The important job of maintaining the forming rolls in correct shape and accurate dimension is performed by a Dumore Precision Grinder. The axis of the quill is placed at right angles

to the axis of the roll, by mounting the grinder on a specially devised bracket at the rear of the lathe.

The increasing use of the Dumore Precision Grinder on production operations is a natural result of its abundantly demonstrated adaptability as well as the high precision of its operation. Many unusual applications are illustrated in the Catalog 42. Send for a copy. The Dumore Company, Tool Division, Dept. TF43, Racine, Wisconsin.



Thread Grinding is a special operation efficiently performed by the Dumore... This bulletin explains how. Send for copy today.

DUMORE

PRECISION AND OFF-HAND GRINDERS

Sold by authorized industrial distributors in all principal cities

STELLITE High-Production Cutting Tools for Low Cost per Piece Machined

STELLITE 98M2 metal-cutting tools are made especially for faster machining of steel. These cobalt-chromium-tungsten alloy tools are also excellent for brass, bronze, cast iron, and most of the machinable materials. They are generally used for turning, facing, boring, grooving, and forming all these materials, and for milling mild steel, cast iron, brass, and bronze.

STELLITE 98M2 alloy has high red hardness, good edge strength, and unusual toughness. This combination of properties makes possible heavy cuts at high speeds with coarse feeds, which in turn means high production at low cost per piece machined.

Write for copies of the informative booklets about STELLITE 98M2 tools illustrated below.



The booklet (left) describes the type of STELLITE 98M2 tools that are available, including sizes and prices for each type.

Through drawings, photographs, and charts, the eight-page booklet (right) describes the cutting angles, lists recommended speeds and feeds, shows chip-breaker grinds, and gives information on wheels for grinding STELLITE 98M2 tools.



Standard Tools in Stock

SOLID TOOL BITS — Square, flat, or round . . . wide range of sizes . . . finish-ground ready for use in standard tool holders. Easily converted to various profiles.

WELDED-TIP TOOLS — A variety of styles and sizes for use where solid bits are impracticable.

MILLING CUTTER BLADES — For many cutter body types, including Ingersoll, Kearney & Trecker, Modern, Production, OK, and Continental.

Special Tools to Users' Specifications

Many types of special STELLITE tools are regularly supplied, cast and finish-ground to users' specifications. These include solid bits, welded-tip tools, milling cutter blades, reamer blades, brazed-in blade shell end mills, form tools, boring tools, counterbores, spotfacers, and reamers.

Complete information on special STELLITE tools can be obtained from any Haynes Stellite Company district sales office.

STELLITE
TRADE-MARK

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York 17, N. Y.



Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

BUY UNITED STATES WAR BONDS AND STAMPS

HIGH-PRODUCTION METAL-CUTTING TOOLS

The word STELLITE is a registered trade-mark.

HOW TO
SOLVE

Cutting Oil Problems

**WHEEL
STAYS CLEAN**

**"FINES"
SETTLE
FAST**

New Oil for Aluminum Grinding

THIS new aluminum grinding oil—S V Solvac Oil 553—may be just the oil you're looking for to reduce rejects and increase production in your plant.

S V Solvac Oil 553 has been thoroughly tested on tough grinding jobs and has proved far superior to other grinding oils. It contains exceptional detergent properties to settle "fines" rapidly and keep grinding

wheels clean and free from metallic "loading."

In one typical operation, grinding 36-inch aluminum rods with an allowable taper tolerance of 1/1000th of an inch, a manufacturer was using an old-type grinding oil and getting a high percentage of rejects.

S V Solvac Oil 553 was placed on the job. Results: Clean wheels; "fines" settled fast; no measurable taper; improved finish; rejects reduced to less than one percent.



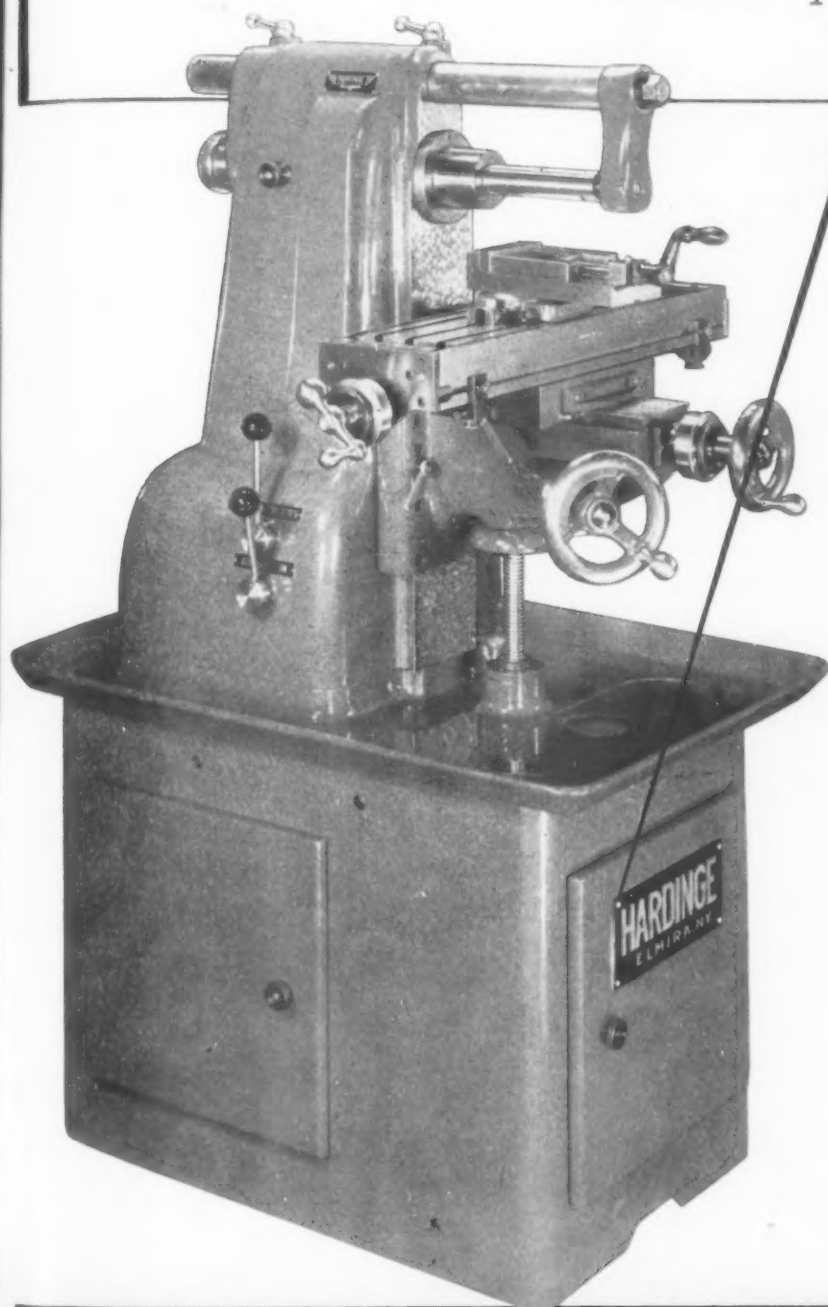
SOCONY-VACUUM

OIL COMPANY, INCORPORATED

SOCONY-VACUUM OIL CO., INC.—Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. • White Rock Div. • Waxburn Div. • Magnolia Petroleum Company • General Petroleum Corporation of Calif.

HARDINGE

High Speed Precision
MILLING MACHINE
is designed for your tool room
and laboratory



HARDINGE
ELMIRA, N.Y.

Precision tool room milling is profitable on this milling machine, designed to meet a definite need in the tool room and laboratory. The precision construction, along modern lines, combines ruggedness with extreme accuracy for ease of operation. Investment and time cost will indicate that larger milling machines are extremely expensive and awkward for many tool room and laboratory milling operations.

SPECIFICATIONS

1" collet capacity, 14" longitudinal, 13 $\frac{1}{4}$ " vertical, 5 $\frac{1}{2}$ " transverse travel, eight speeds from 110 to 1850 R.P.M. TM model for plain milling, UM model for spiral milling.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



Accuracy You can Trust...



Recent Woodworth developments mark definite advancements in the gaging and production tool fields.

Gages of cast Stellite alloy are showing phenomenal results in long wear. Woodworth's exclusive segmented shank construction of Carboloy bushing-type plug gages insure trouble-free gage life.

The LIMITROL . . . a comparator-type roll snap gage . . . can be efficiently and accurately used by less skilled inspection help.

Comparable advantages will be found in all other Woodworth products.



Accuracy You
Can Trust

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • GROUND THREAD TAPS • FORM TOOLS • PRECISION MACHINED PARTS • HEAT TREATING • PLATING



THE ECONOMY SIZE PACKAGE OF BAD NEWS

When they put the job of shell production up to centerless grinding—they produced these packages of bad news in huge quantities and with heartening speed. And in plant after plant where shells and other materials for war and peace are ground to close tolerances by the centerless technique, the choice has gone to wheels by Carborundum. Again it's a case of selecting the right wheel for the job.

For wheels by Carborundum have a well-

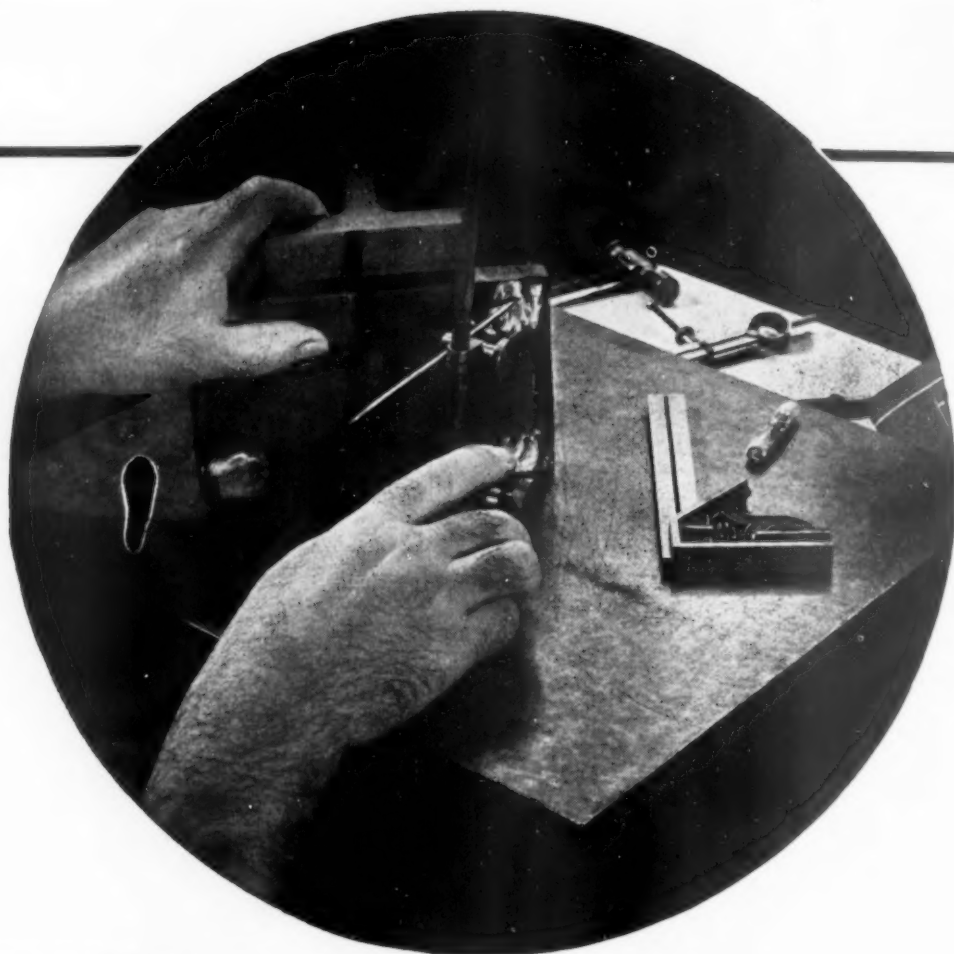
deserved reputation for increasing production, insuring greater accuracy and lowered grinding costs. And as a result of close cooperation with industry there is a wheel by Carborundum for every grinding operation. Carborundum Abrasive Engineering Service will be glad to work with you to get the best and the most from your grinding wheels. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
ABRASIVE PRODUCTS



Grinding Wheels by **CARBORUNDUM**

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids
(Carborundum is a registered trade mark of and indicates manufacture by The Carborundum Company)



RE-EXAMINE your tooling now for cost reduction

PRODUCTION COSTS CAN BE CUT WHEN A TOOL STEEL FULLY MEETS SPECIFIC REQUIREMENTS

The urgent need for speed in wartime tooling has compelled many toolrooms to accept compromises in materials and methods. As a result, short tool life, hardening difficulties, and too frequent regrinds have affected costs and tool performance.

With the initial tooling-up job well in hand in many plants, now is a good time to smooth out some of these wartime tooling problems and look for ways of reducing costs and improving performance.

Check over the specific requirements of each job. See which of the following properties are needed to provide longer tool life—higher output with fewer regrinds—lower tool cost:

- Greater wear resistance
- More toughness
- Higher impact strength
- Greater hardening safety
- Greater red-hardness
- Greater accuracy and hardening

Carpenter provides a simplified guide to tool steel selection—a diagram of nine Matched Tool Steels—that will solve over 90% of all the jobs that will come up in your toolroom. The matched diagram makes it easy to select steel to meet the desired performance. Before the tool is made, you know what to expect in toughness, hardness and wear resistance.



Re-examine your tooling program now. Find out how this matched set method can help you cut costs and increase profits. If you are responsible for tooling or tool production write today on your company letterhead for a copy of the Carpenter Matched Tool Steel Manual. (Free to tool steel users in the U. S. A.)

The Carpenter Steel Co., 122 W. Bern St., Reading, Pa.



FASTER PRODUCTION

FOR

Two Worlds!

TODAY

TOMORROW

ARO

PNEUMATIC TOOLS

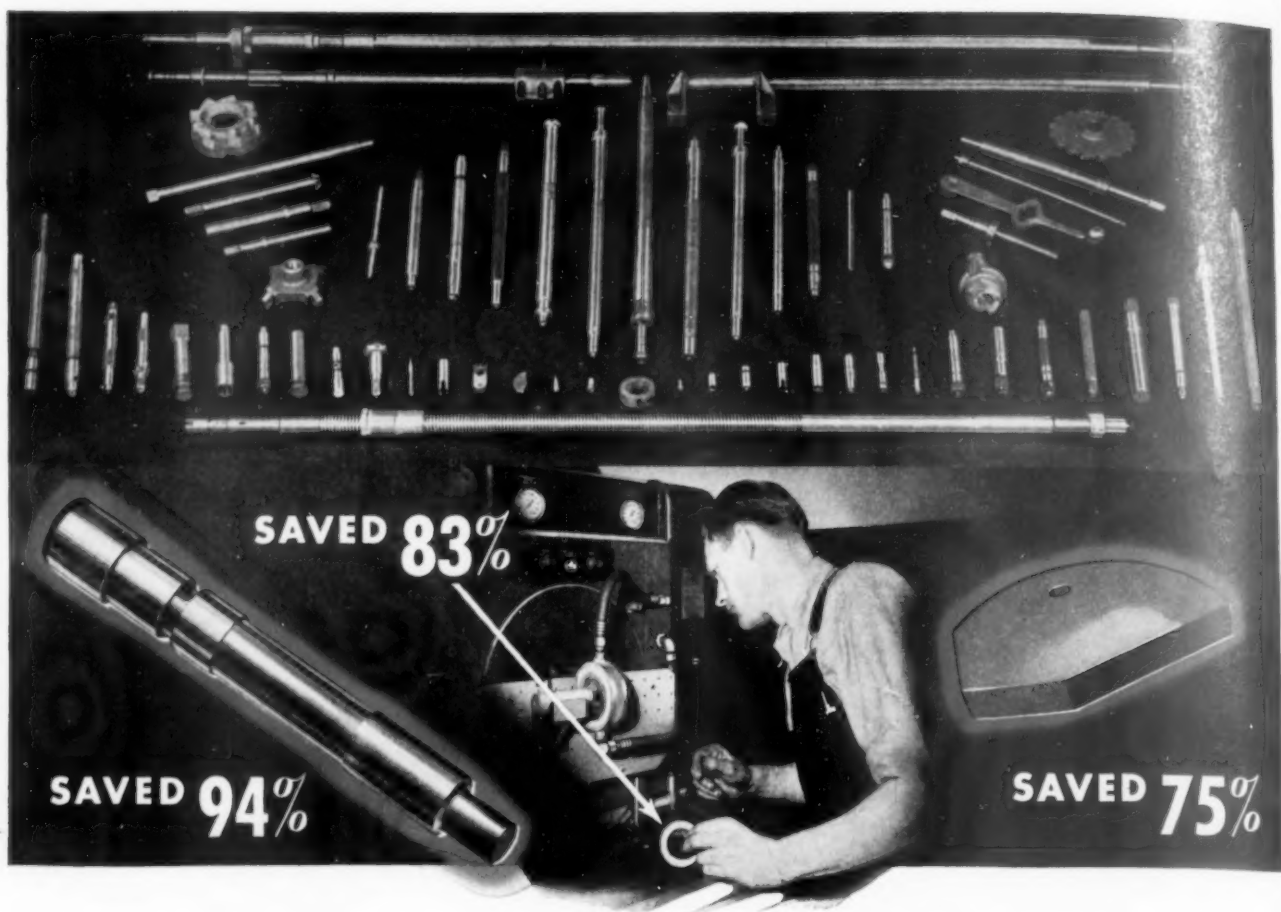
Today—ARO Pneumatic Tools are speeding up small tool jobs for all branches of industry in win-the-war production.

For drilling, grinding, burring, filing, screw-driving, nut-setting and many other small tool operations, ARO Pneumatic Tools get more work done... with less fatigue! They're engineered to furnish more power than average tools of their size—ruggedly constructed—simple in design—stall-proof.

Tomorrow—for peacetime products—ARO will continue delivering Tools for top-speed production! Write... The Aro Equipment Corporation, Bryan, O.

A handful of power in this new ARO model 101 with plastic housing and handle—weighs only 1 lb. 9 oz.—operates full 1/4-inch drill.





“Hot-Bed” of THRIFT at Kearney & Trecker

SINCE a year before Pearl Harbor, a speedy TOCCO Induction Heat Treating Machine has teamed up with progressive engineers of Kearney & Trecker Corporation, Milwaukee, Wisconsin to produce saving after saving . . . improvement after improvement . . . for part after part of the quality line of Milwaukee Machine Tools.

Now, 138 different parts are TOCCO-hardened by Kearney & Trecker. These range in size from 1-oz. pins to 90-lb. table screws. Material includes carburized low-carbon steels, medium

carbon and plain carbon steels and alloy steels.

Production increases of 100% to 500% and cost reductions as high as 94% are obtained . . . and these benefits are being sought continually for more and more of their heat-treated parts.

Typical output for an 8-hr. shift is 1600 pieces—10 different parts (5 different fixture set-ups).

Find out how TOCCO can speed *your* production and cut *your* costs. New booklet, “Results with TOCCO”, free on request.

THE OHIO CRANKSHAFT COMPANY • Cleveland 1, Ohio

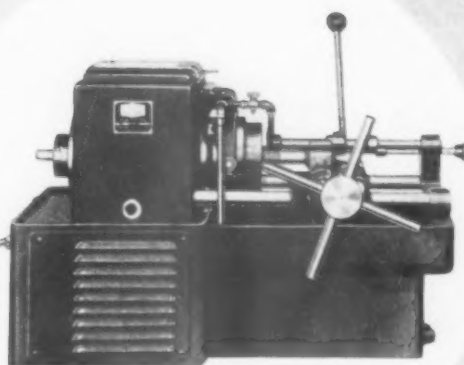


TOCCO

HARDENING..BRAZING
ANNEALING..HEATING



WATCH MY SPEED!



**OSTER No. 531 "TOM THUMB"
THREADING
MACHINE**

Rotary Die-Head, fully adjustable.
Open-type Vise saves time dropping
stock into and removing from machine.

Note typical speeds in tables at right. These are "samples" of performance maintained regularly by the Oster No. 531 "TOM THUMB" Threading Machine.

Fast, accurate, low cost threading of bolts, rods, studs, pipe and nipples are among the many standard uses for this machine. Through the application of special fixtures, a wide range of unusual threading jobs can be handled also.

REGULAR RANGE OF No. 531 "TOM THUMB"

Bolts, rods, or studs: $\frac{5}{16}$ " to $1\frac{1}{4}$ " N. C. or Whitworth; $\frac{3}{8}$ " to $1\frac{1}{2}$ " N. F. or B. S. F. Pipe and nipples: $\frac{1}{8}$ " to $1\frac{1}{4}$ ".

Note: Where portability is required, the Oster No. 531 "TOM THUMB" Threading Machine can be furnished mounted on an all-steel wheel stand.

As the ONE machine to handle ALL threading work or as an auxiliary to the big threading machines, No. 531 "TOM THUMB" is ready for action anywhere.

Write for "Catalog 7-B".

BOLT AND ROD THREADING TIME IN SECONDS

Bolt Size	Gripping in Vise (seconds)	Threading (seconds)	Removing from Vise (seconds)	Total Floor to Floor (seconds)
$\frac{5}{16}$ "	3	28	2	33
$\frac{1}{4}$ "	3	26	2	31
$\frac{3}{8}$ "	3	22	2	27
1"	3	21	2	26
$1\frac{1}{4}$ "	3	20	2	25

Note 1—Above time study based on bolt threads 2" in length, National Coarse Standard.

Note 2—Time study below based on American National Pipe Threads

PIPE THREADING TIME IN SECONDS

Pipe Size	Gripping in Vise (seconds)	Threading (seconds)	Removing from Vise (seconds)	Total Floor to Floor (seconds)
$\frac{1}{8}$ "	3	8	2	13
$\frac{1}{4}$ "	3	8	2	13
$\frac{3}{8}$ "	3	9	2	14
$\frac{1}{2}$ "	3	10	2	15
$\frac{3}{4}$ "	3	12	2	17
1"	3	14	2	19
$1\frac{1}{4}$ "	3	18	2	23

OSTER for faster, better threading

THE OSTER MANUFACTURING COMPANY, 2063 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.



BETTER SHOP PRACTICES **TODAY** *are part of your Post War Planning*

● There is no doubt about the fact that many shop practices dictated by today's crying need of top efficiency production will carry over into greatly improved production practices in the postwar era.

Education of shop men in methods of tool conservation, for example, has been a war necessity, but can become a definite profit item for you in postwar competitive production. Thus today the Cushman Chuck Check Card helps prolong the life of these fine precision tools for more efficient war production, but its use in your plant can well form part of a plan for greater efficiency in shop operation that will find your organization better prepared for postwar production . . . better able to make a profit in postwar competition.

CUSHMAN CHUCKS

CHUCK - CHECK

A STITCH IN TIME FOR VICTORY

The chuck on your machine needs a LITTLE attention REGULARLY. Neglect of these rules will affect the accuracy of your work and cause "down time". Chucks are essential war production tools. "Keep 'em running to keep 'em flying."

- V 1. Check lubrication on every shift.
- V 2. Wipe surfaces . . . especially spindle noses and bearing surfaces . . . CLEAN of chips, etc. before mounting.
- V 3. Never FORCE chuck on spindle nose.
- V 4. Keep keyways, jaw bearings free from dirt, chips, etc.
- V 5. Do NOT open jaws beyond outer edge of chuck circumference (use larger chuck if necessary)
- V 6. Use correct jaw equipment for work to be held.

CUSHMAN CHUCKS

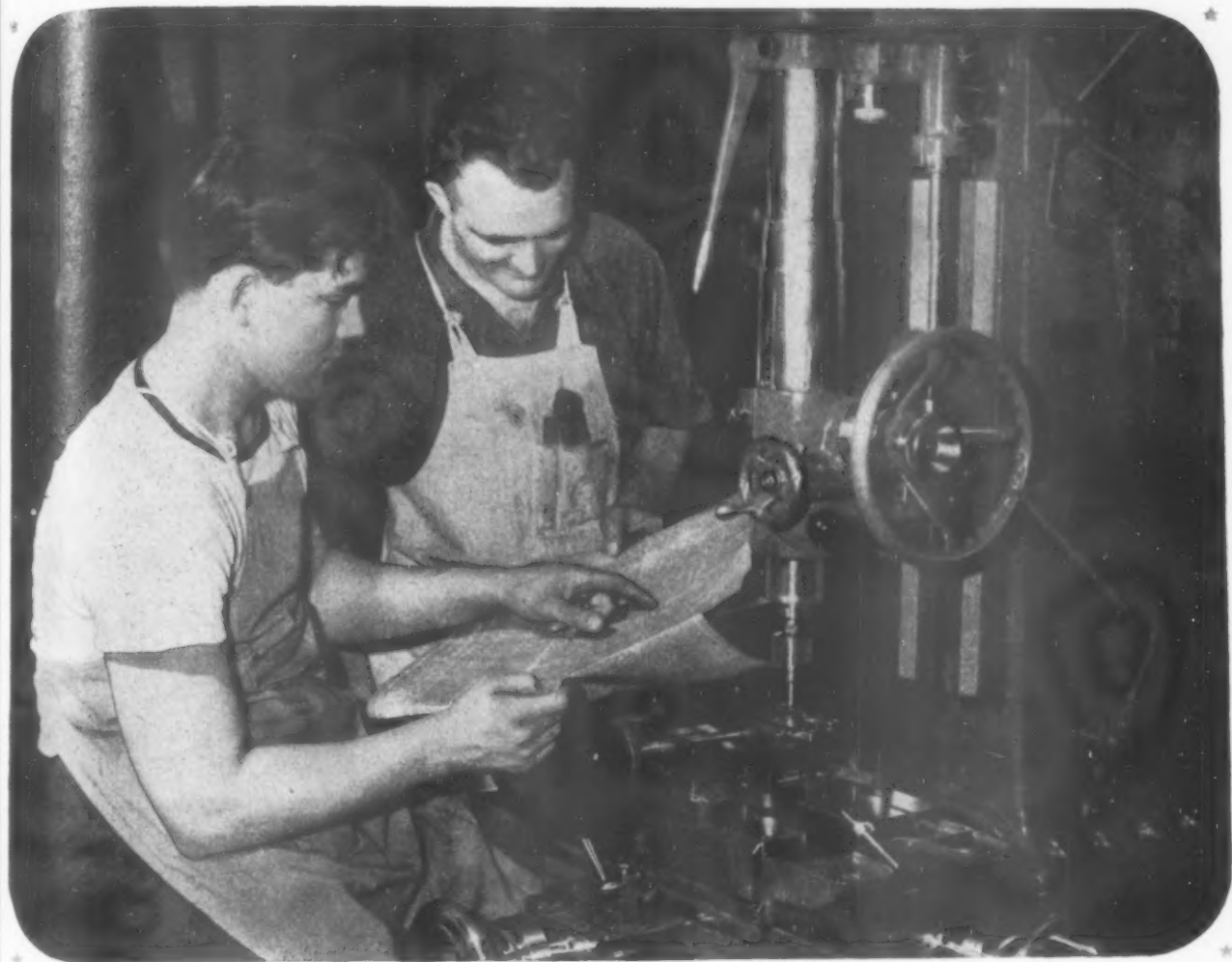
A WORLD STANDARD FOR PRECISION

THE CUSHMAN CHUCK CO. HARTFORD, CONN.

We will be glad to supply a quantity of Chuck Check Cards for use in your plant and suggest that they be posted near all machines using Cushman Chucks.

A WORLD STANDARD FOR PRECISION





The Men that Know "HOW" and "WHY"

PUT OUT MORE PRODUCTION . . . WITH LESS WASTE !

HAND BOOK OF SPECIAL STEELS

Newly revised and reprinted—a comprehensive book on the properties, uses, and best methods of handling, treatment, etc. of tool, stainless and other alloy steels. Plenty of tables to facilitate quick reference and selection. 136 pages, pocket-sized, latest data.

SEND FOR
YOUR COPY

DEPT. TE-23



THE special high-alloy steels take more knowing than ordinary materials, that's sure. But they also *give* you more—so much more that their uses have taken one of the steepest upward climbs of any class of materials in recent years.

Electric furnace steels are on the march. Our principal special steel products—corrosion and heat-resisting alloys, tool and die steels, electrical, valve and nitriding steels—have been among those in keenest demand for war use. They're also products which offer you the greatest future promise.

As pioneers and originators in these fields, we have the data you

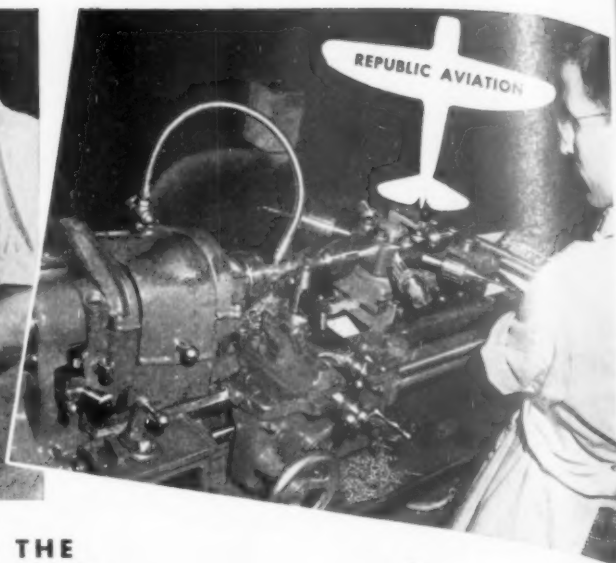
engineers and designers need, and the working information for your shopmen to handle special steels well and speedily. Let us help you.



**Allegheny Ludlum
STEEL CORPORATION**

GENERAL OFFICES: BRACKENRIDGE, PENNA.

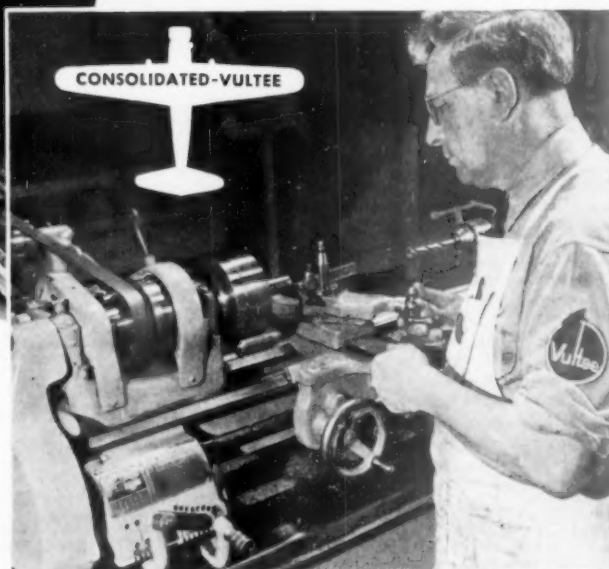
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IN THE

Aircraft Industries

SOUTH BEND LATHES have long been popular for precision manufacturing operations and fine tool work in the aircraft industry. Today, in the greatest plane production schedule in history, these modern lathes are more than keeping their traditions for dependable precision and exacting tolerances. Providing lathes to most of the aircraft industry is one of our many important war assignments.



TRAINING HELPS

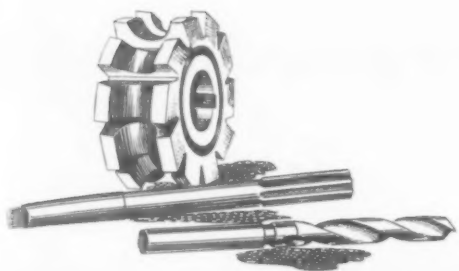
South Bend training helps—books, sound films, wall charts, and booklets on the care and operation of engine lathes and toolroom lathes—are available for facilitating the training of new lathe operators. Write for a copy of Bulletin 21-C.

BUY WAR BONDS NOW... SAVE FOR LATHES

SOUTH BEND LATHE WORKS

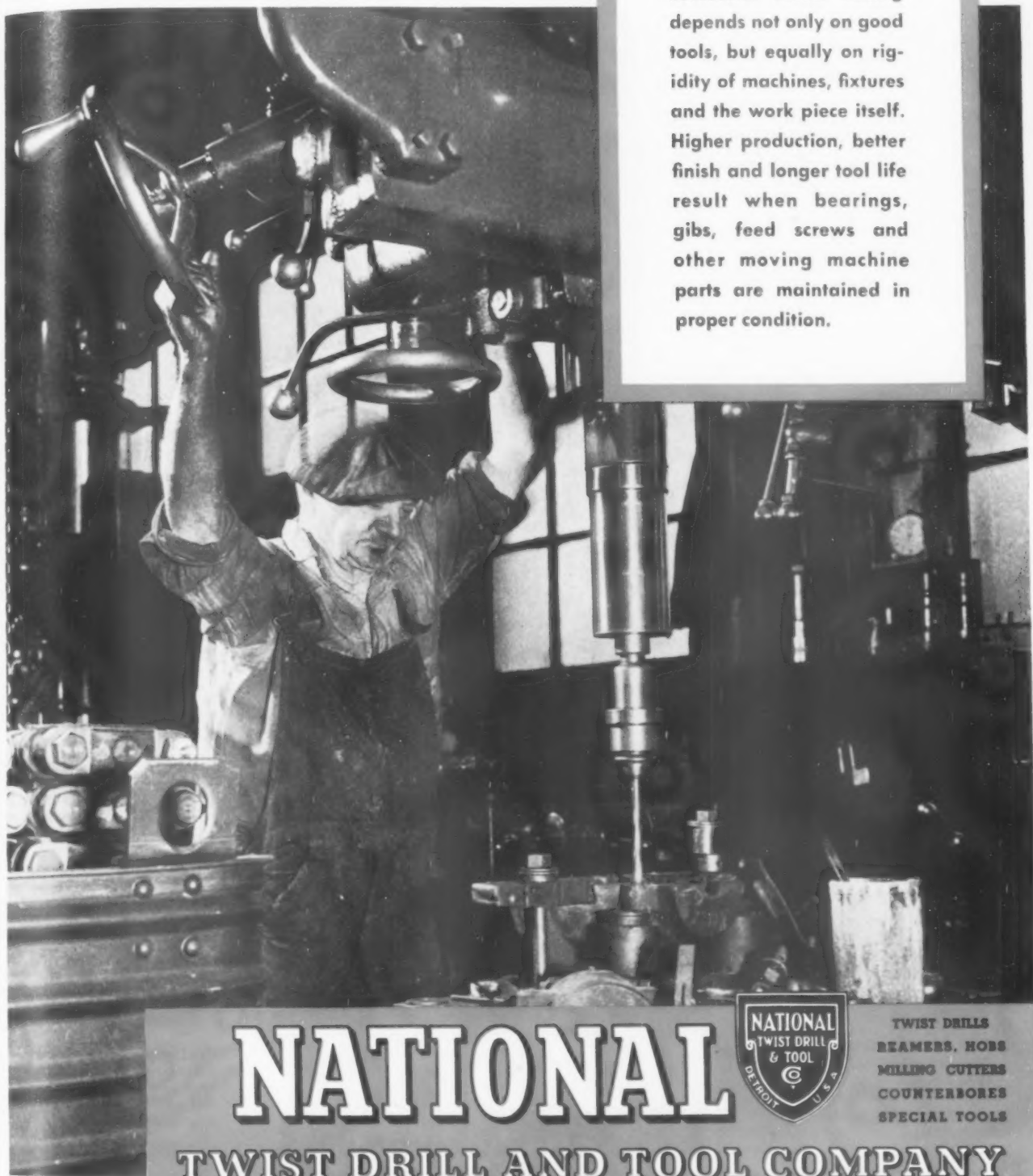
LATHE BUILDERS FOR 37 YEARS • SOUTH BEND 22, INDIANA





Rigidity IS IMPORTANT

Successful metal cutting depends not only on good tools, but equally on rigidity of machines, fixtures and the work piece itself. Higher production, better finish and longer tool life result when bearings, gibs, feed screws and other moving machine parts are maintained in proper condition.



NATIONAL



TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

TWIST DRILL AND TOOL COMPANY

HOME OFFICE AND FACTORY—DETROIT, MICH.

Tap and Die Division—Winter Brothers Co., Wrentham, Mass.

Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities

MILLING CUTTERS • BROACHES • FORM TOOLS • END MILLS • HOBS

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WHERE THE NEED EXISTS FOR
 REAMERS OF SPECIAL DESIGN,
 INDUSTRY'S LEADERS FIND IT
 PAYS TO RELY UPON LAKE
 SHORE'S ENGINEERING EX-
 PERIENCE AND COMPLETE
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COUNTER BORES • REAMERS • STANDARD END MILLS AND MILLING CUTTERS FROM STOCK • SPECIAL CARBIDE TIPPED TOOLS

MILLING CUTTERS • BROACHES • FORM TOOLS • END MILLS • HOBS

Back of every Lake Shore Tool are the facilities and skilled personnel of one of America's most completely equipped plants.

LAKE SHORE

TOOL WORKS INC.

Send us your blue prints for quotations on your high speed tool, special tool, and carbide production tool requirements.

816 NORTH KOSTNER AVENUE • CHICAGO 51, ILLINOIS



WORK GOES *FASTER...*

with Gisholt's Automatic Turret Indexing and Clamping

A turn of the pilot wheel is all it takes to withdraw the hexagon turret on a Gisholt Ram-Type turret lathe—and to unclamp and index it to the next position. As the slide again moves forward to approach the work, the new turret face, accurately located square with the spindle, is automatically clamped in rigid cutting position. To complete the entire cycle, the operator doesn't take his hand from the pilot wheel.

The automatic indexing and clamping provided by Gisholt is the most efficient known on a turret lathe. It makes turret lathe operation simpler and easier. It speeds war production, *now*—cuts costs *anytime*.



GISHOLT MACHINE COMPANY
1229 E. Washington Ave. • Madison 3, Wisconsin

Look Ahead—Keep Ahead—With

Gisholt Improvements in Metal Turning



The tapered steel locating pin and bushings are hardened and ground to assure accuracy for the life of the machine. The double beveled clamp ring, operated by a powerful eccentric toggle, relieves the locating pin of all strain in taking heavy cuts.

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES.



LIPE Carbo-matics are flexible enough to handle the job!

One thing is certain, cutting speeds will be high in the postwar world. Only high surface speeds give top performance with carbide tools. Even so, speeds, cuts and feeds will vary widely according to the many new materials, and whether rough, finishing or intermittent cuts are being made.

That's why Lipe Carbo-Matic's wide range and multiple combinations of speeds, cuts and feeds will count heavily. Carbo-Matic's rock-like rigidity will be important, too—insuring finer finish, longer tool wear, less tool breakage, and fewer rejects. Every Carbo-Matic tests to .0005" accuracy—with perfect roundness and parallelism.

ALL THESE FEATURES

198 Spindle Speed Changes by pick-off gears.

Low-Gear Head with speeds from 59 to 1151 rpm.

High-Gear Head with speeds from 194 to 3100 rpm.

Feed Per Revolution in infinite variations by micrometer control of a hydraulic orifice.

Rigidity that makes possible tolerances ordinarily produced by rough grinding.

Smoothness that only a fully-enveloping cone-worm-gear drive can give.

Hydraulic Control of front tool carriages, back facing attachment, work-holding equipment, and tailstock quill.

Power up to 20 hp, unusually high for a lathe with 8" swing, 30" between centers.

Fully Automatic throughout operating cycle. Loading, unloading only manual operations.



LIPE-ROLLWAY CORPORATION
SYRACUSE 1, N. Y.

CONSTANT FLOW RATE

Regardless of
**VARIATIONS IN
FLUID PRESSURE**



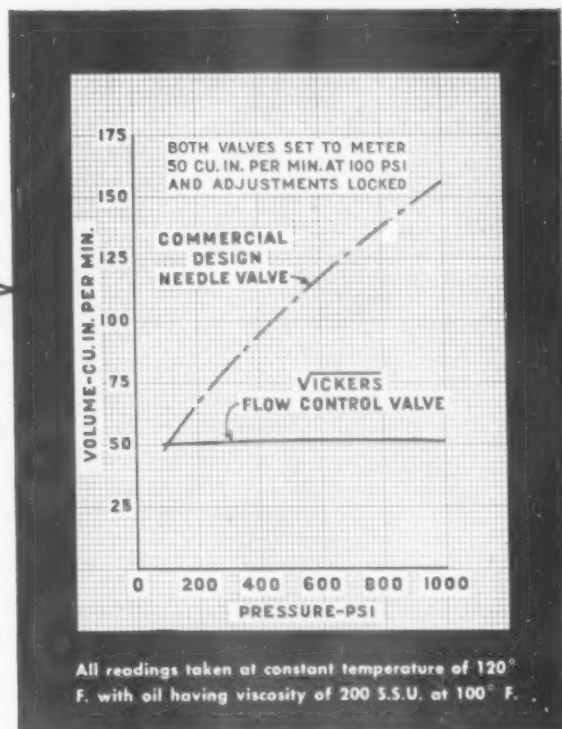
As shown by test chart at right, the Vickers Flow Control Valve maintains a practically constant metering rate (for a given setting of the control adjustment) regardless of variation in fluid pressure. This ability to accurately control the rate of travel of tool head or slide . . . or the rpm of a hydraulically driven work spindle . . . at all times regardless of the resistance encountered is a fundamental requirement of many types of machine tools and special machinery. The absence of a hesitation, jump or a speed variation with a load change is important because these nearly always are detrimental to tool life, work finish or proper operation. Tool damage when "breaking through" work is eliminated and variations in cut or operating pressure have no appreciable effect upon feed rate. See Bulletin 40-15 for complete information.

Vickers Application Engineers will gladly discuss with you how "hydraulics" can be used to your advantage.

VICKERS Incorporated

1416 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices: CHICAGO • CLEVELAND • DETROIT • LOS ANGELES
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VICKERS Adjustable **FLOW CONTROL VALVES**

Representative of More than 5,000 Standardized Vickers Units
for Every Hydraulic Power and Control Function



CONSTANT DELIVERY
PUMPS



FLUID
MOTORS



DIRECTIONAL
CONTROLS



VOLUME
CONTROLS



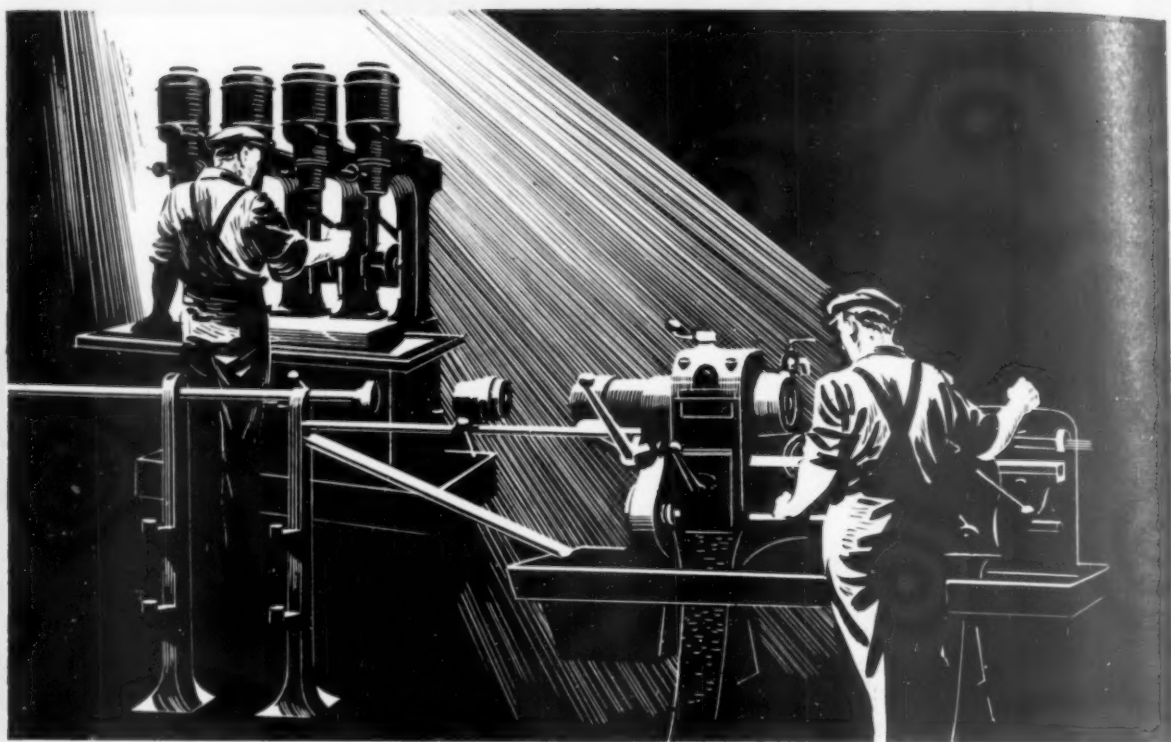
PRESSURE
CONTROLS



CONTROL
ASSEMBLIES



VARIABLE DELIVERY
PUMPS



Where reverses bring success...

Rapid reversals for various motions on modern high-speed machine tools provide the opportunity to decrease machining times. Multiplied by the number of reversals per work cycle and the number of cycles per day, these operations add up to a sizeable number of man-hours. In a postwar competitive market, the savings on time can mean the difference between success and failure.

Regardless of the application—lathe—drilling and tapping machine—multiple spindle drill—there is a Westinghouse A-C reversing drive to fit the job. Successful installations, proved in use, include lathe drives capable of reversing 15 to 25 times a minute and drills, 14 to 60 times a minute.

For example, one machine tool builder uses a Westinghouse multiple-speed motor rated at $3/2/1-1/2/1$ hp, 3600/1800/1200/600 rpm, and providing 6, 14, 24 and 60 reversals per minute for these speeds, respectively.

The determination of the proper rating and size of motor for a specific machine tool application is but one of the many problems of machinery electrification for which Westinghouse can supply you the proper answer. This ability to provide simple electrical solutions to complex mechanical problems is yours for the asking. Just call your nearest local office. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

J-94619

Westinghouse

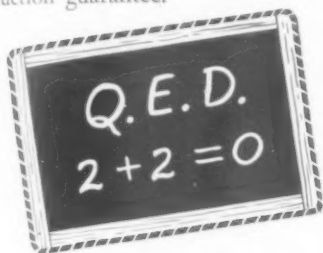
PLANTS IN 25 CITIES

OFFICES EVERYWHERE



LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATI

JUNE, 1944



Triple saving surprises manufacturer. Torn threads in machining stainless steel stock posed a problem for a screw machine product manufacturer in Michigan. Spoilage cut materially into profits. The waste of scarce materials was even more important at the time. Poor tool life seemed to be one cause as well as a problem. A real effort was made to find the answer. A number of cutting fluids were thoroughly tested—Stanicut 137BCS being the last one. It was last because no more were tried; it more than answered the need.

With Stanicut, threads improved and rejects were practically eliminated. Production jumped 47% on the operation. Tool life was tripled. Three blessings where the manufacturer had looked for but one.

Lubrication engineering helps high-speed press handle deep draw. To make equipment on hand do the job that was needed, was a frequent problem when plants were changing over to war work. The situation may be repeated in reconvert-ing to peacetime production. The

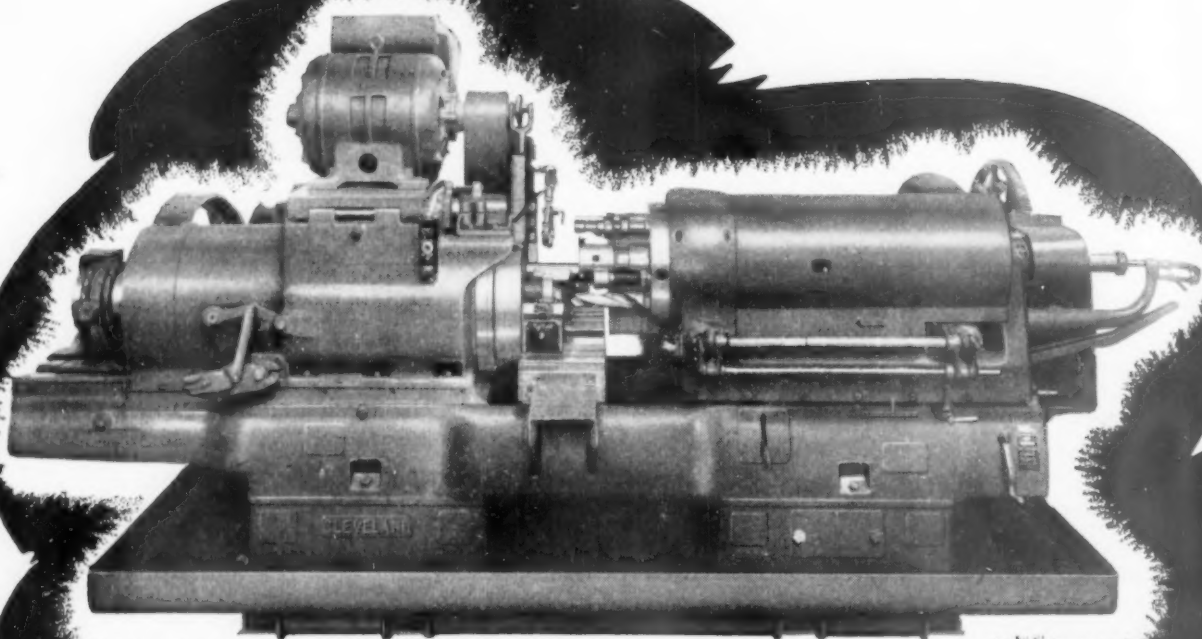
The job was deep-drawing an aluminum cup with a $\frac{3}{8}$ inch radius at all edges. The problem was breakage. The principal reason was the fact that the minimum speed of the press was too fast for the job. The plant men were well aware of this—but that didn't solve the problem. The job had to be done. The press had to do it. The only possible remedy left was to find a stamping compound that might help.

Perhaps Acme Base wasn't the *only* answer, but it was the *right* answer at the *right* time.

Gasoline Powers the Attack...

Don't Waste a Drop

**STANDARD
SERVICE**



There Are **CLEVELANDS** Big Enough

*Remember—
**CLEVELANDS!
CUT COSTS!***

SALES OFFICES

CHICAGO:

1408 Civic Opera Building

DETROIT:

540 New Center Building

NEWARK:

902 American Insurance Bldg.

CINCINNATI:

1315 American Building

... for really heavy full automatic work, like this Model A 10" Cleveland. There are Clevelands small enough for high production on bar stock down to 9/16"—and a wide range of models for every size between. All of them save money because they *set up quickly* and produce rapidly, multiple operations often requiring two or more individually manned machines of other types. ● Also Cleveland-made high pressure hydraulic die-casting machines for magnesium, aluminum, brass, bronze, zinc, tin or lead. ● *Ask for Cleveland bulletins on automatic or die-casting production equipment.*

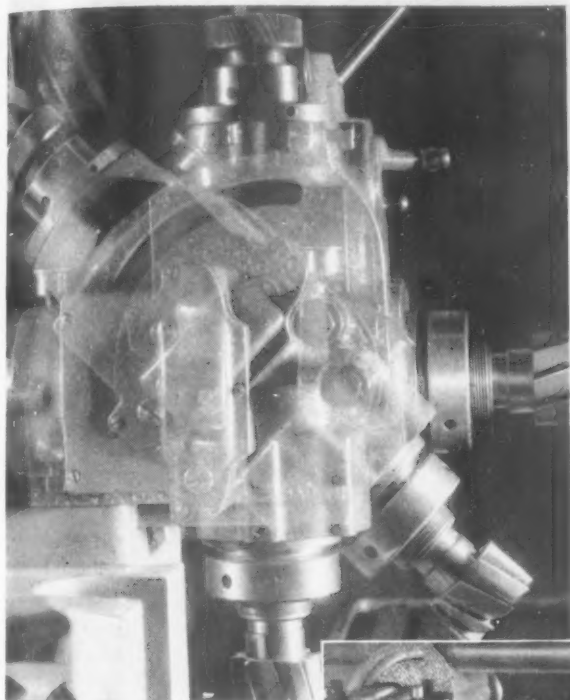


THE CLEVELAND AUTOMATIC MACHINE CO.
CLEVELAND 3, OHIO

VAN NORMAN RAM-TYPE UNIVERSAL MILLERS



Save Set-Ups, Cut Cost on Milling



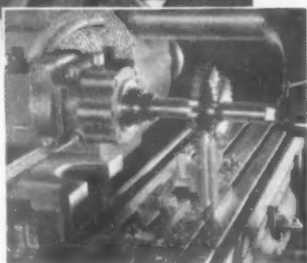
Idle machine time, caused by reset-ups, often cuts the productive capacity of milling machines by as much as 70%.

You can reduce these time-wasting reset-ups and increase machine and operator output up to 40% overall time with Van Norman Ram-Type Universal Millers.

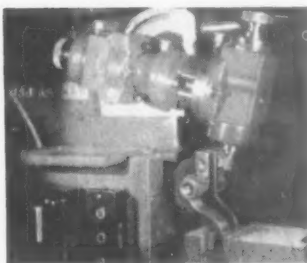
Here's how it's done. The operator first sets up the work-piece. Then, by simply changing the position of the adjustable cutterhead from horizontal . . . to angular . . . or vertical positions, and by moving the movable ram in or out — the operator performs practically all his milling operations with minimum reset-ups. Result — faster work, greater machine capacity and less possibility of errors.

Add to the above advantages . . . directional front and rear controls of all power feeds, large easy-to-read dials . . . solid rigidity — and you'll readily see how Van Norman Ram-Type Universal Millers assure greater accuracy, increase output and cut costs.

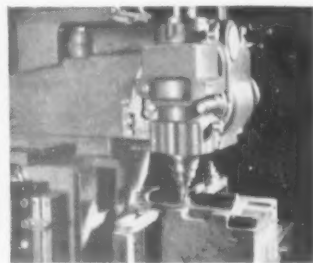
▲ **ADJUSTABLE CUTTERHEAD**
Gives Vertical . . . Angular . . .
Horizontal Milling — All on ONE
Van Norman Ram-Type Universal
Miller.



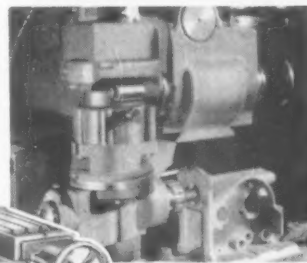
HORIZONTAL MILLING



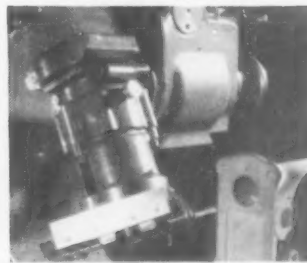
ANGULAR MILLING



VERTICAL MILLING



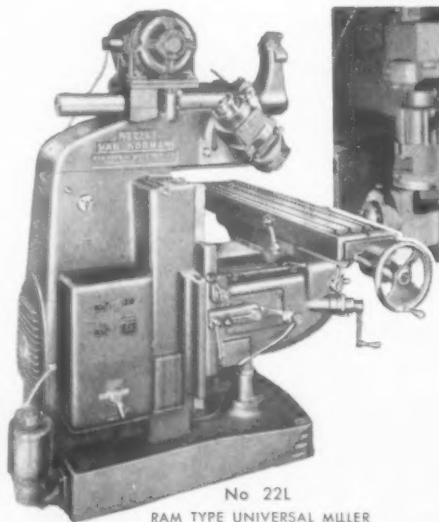
BORING



SLOTTING



ANGULAR MILLING



No. 22L
RAM TYPE UNIVERSAL MILLER

VAN NORMAN COMPANY

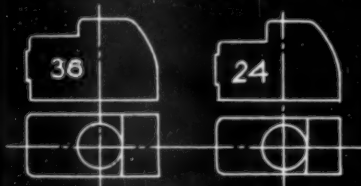
SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"

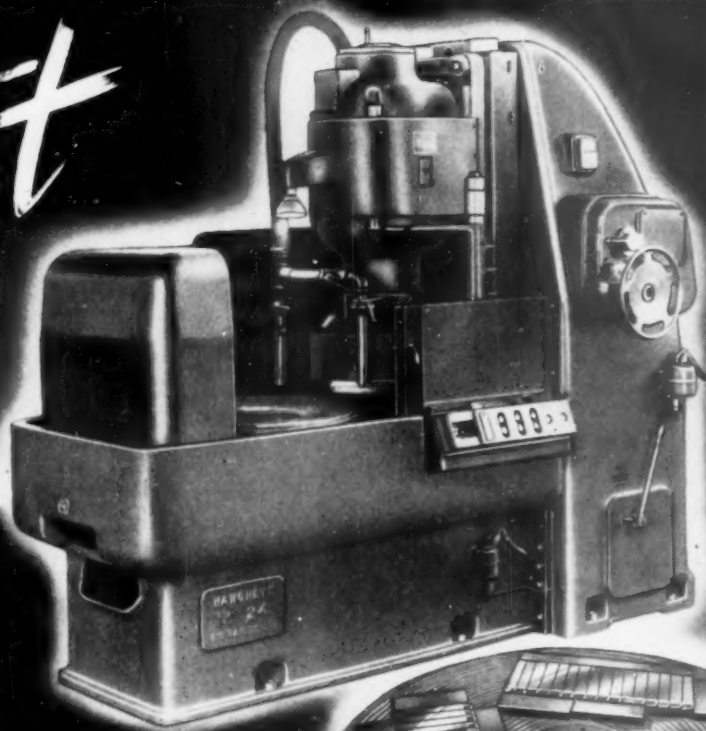
FINISH SMALL PIECES

Fast

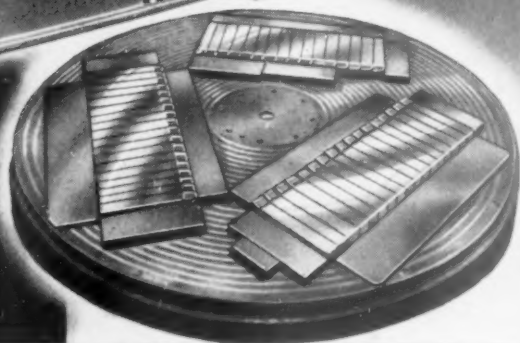
HANCHETT NO. 24 SURFACE GRINDER



Showing comparative size of the No. 24 60" x 108" and the No. 36--68" x 128"



24-inch Magnetic Chuck shown loaded with a quantity of cutting tools for finishing.



Similar in construction to the well-known Hanchett No. 36, the No. 24 Rotary Surface Grinder is electrically powered, controlled from a panel of push-buttons . . . equipped with a 24- or 30-inch magnetic chuck for easy, time-saving set-ups . . . the grinding wheel head is dynamically balanced, assuring constant accuracy.

Valuable floor space is saved, too, through the built-in coolant tank and the compact floor dimensions of the No. 24, only 60" by 108".

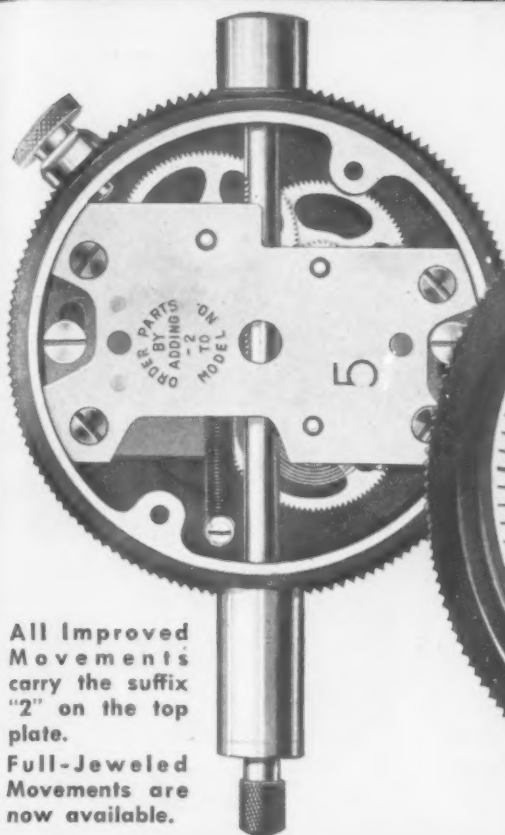
The versatility of this machine will make it an integral part of your production plans—while primarily suited for fast output on small pieces, the No. 24 handles work up to 36 inches in diameter and up to a height of 14 inches.

The No. 24 comes equipped with either segmental or cylindrical type grinding wheels, as your needs require. Write for additional details, in bulletin 170-T-8.



IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.
BIG RAPIDS, MICHIGAN U.S.A.



All Improved Movements carry the suffix "2" on the top plate.
Full-Jeweled Movements are now available.



The IMPROVED FEDERAL DIAL INDICATORS

Again Federal steps ahead with new improvements and refinements in the design and construction of its Dial Indicators. Effective at once all models, except the "A" size, will include the following improvements:

Better Proportioned Gears— Revised gears enable more positive mounting with less danger of loosening. Greater strength in the rack gear is obtained because of its new and larger size.

Improved Pinion Bearing— The bracket supporting this bearing has been enlarged. The bearing itself is jeweled. The method of positioning it is improved. This means more precise tooth contact and more rigid support.

More Accurate Alignment— of the gear bearings in the top and bottom plate is insured by improved manufacturing methods.

Greater Strength— The rack slide is held more positively.

Elimination of Distortion— By improved means of attaching the top and bottom plates together, better alignment is obtained and bearing friction reduced still further.

More Positive Movement Setting— Accuracy of the movement is improved. There is also greater latitude in adjusting the movement with the rack spindle.

FEDERAL

Was the First to . . .

Use Jeweled Bearings.

Introduce Low-Friction Indicators.

Reduce Glare by Blackening the Indicator Bezels, Cases, etc.

Standardize Dimensions for Interchangeability.

FEDERAL PRODUCTS CORPORATION · 1144 Eddy St., Providence, R. I.

★ ★ ★ ★ ★ **FEDERAL** ★ ★ ★ ★ ★

PRECISION MEASURING INSTRUMENTS

HOW TO APPLY THE TIME-SAVING ADVANTAGES OF

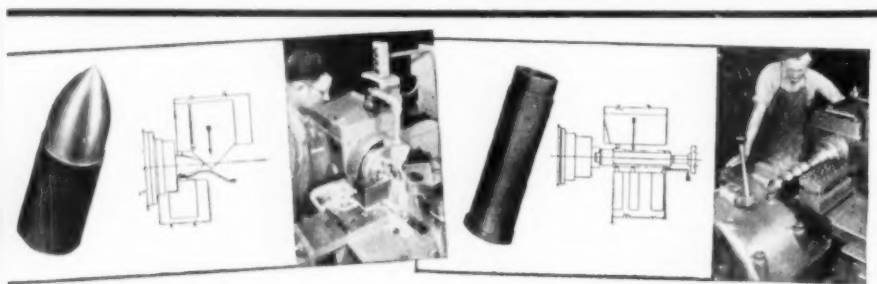
Multiple Tooling and Automatic Cycling to **BOTH** Long and Short-Run Turning . . .



**ONE REASON
WHY IT IS POSSIBLE
TO INCLUDE
SHORT-RUN WORK
ON THIS
AUTOMATIC
LATHE**

Here are two typical pages from this new book. The simplicity of set-up of the Sundstrand Automatic Lathe is only one of *seven reasons* why this lathe can handle both long and short-run turning work more profitably. Jobs of both types, as well as special turning jobs, are described complete with tooling diagrams and illustrations.

Whether you have a mass production, short-run or a combination of both types of turning jobs, the Sundstrand Automatic Lathe can be tooled up to handle either one faster. This is due to the seven machine design factors which have been incorporated in this outstanding lathe.



A Long-Run Turning Job

Starting from bar stock, cut to length, the Sundstrand Automatic Lathe contour turns and forms the nose of 75 mm. shot. Oftentimes one operator can run one or more machines, depending upon the cycle time.

A Short-Run Turning Job

On a lot of 40 sleeves the turning time was reduced from 75 to 8 minutes. Other parts turned include sprockets, pulleys, gears, etc., with lot sizes of 25 to 100 pieces.

The simplicity of cycle change-over and set-up, for instance, permits setting up some jobs in less than 30 minutes...making it profitable to tool up for short-run turning. Obviously, these savings are also available and desirable for long runs.

Get the complete information on this lathe today. The free booklet offered contains a lot of valuable turning information that may prove profitable on *your* turning work.



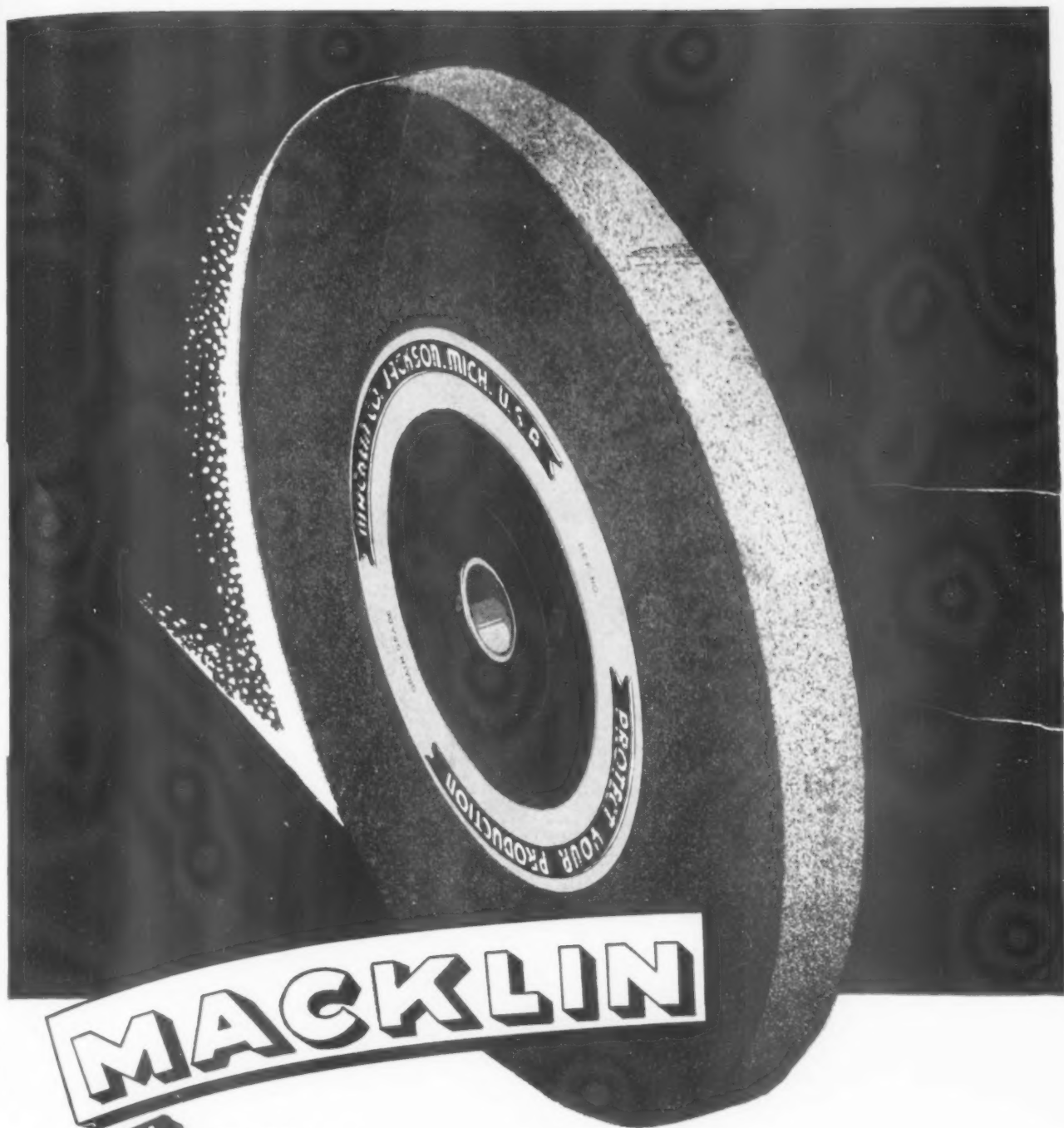
GET THIS FREE BOOK TODAY → → →
You'll find many lathe jobs similar to yours in this book. You'll also find valuable production data to compare with the performance of your present equipment. Write for your copy today. Ask for book 825.



SUNDSTRAND MACHINE TOOL CO.

Rigidmills • Fluid-Screw Rigidmills • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2532 ELEVENTH ST., ROCKFORD, ILLINOIS, U.S.A.



This FREE 64-page
book still available,
write for your copies.

MACKLIN HIGH QUALITY WHEELS
FOR EVERY GRINDING PURPOSE WILL

"PROTECT YOUR PRODUCTION"

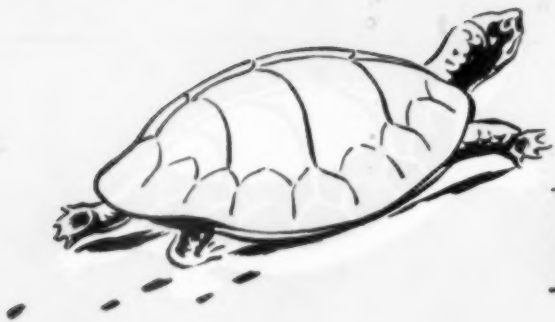
Ask for the services of a Macklin Field Engineer

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia



INCHING



Slow speed for inching, threading and close inspection of work in process is but one example of the versatility of Reliance motor-drive. Properly applied, motor-drive is more than power. In addition to controlled and variable speed, it can be the means of: smooth, controlled acceleration—automatic reversing, quick stopping—control of tension—tandem operation. With Reliance motor-drive these functions can be provided electri-

cally, eliminating such mechanical devices as clutches and gears.

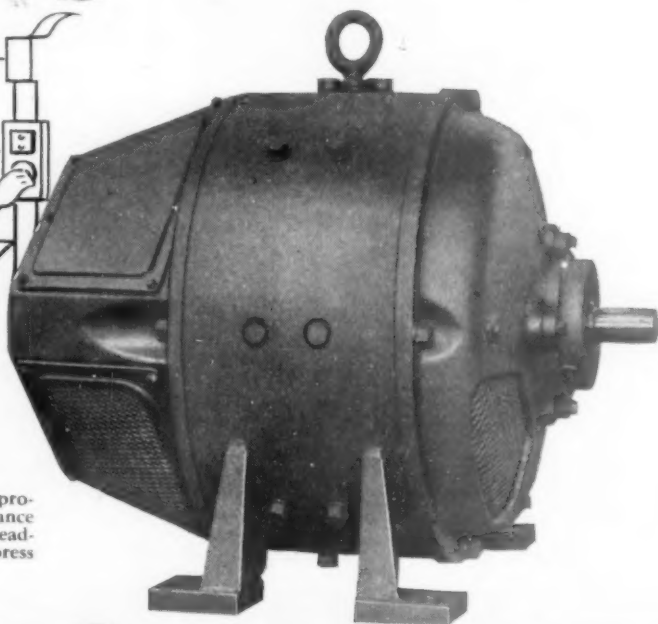
Reliance engineers have had wide experience in developing new uses for modern motor-drive and, in cooperation with plant engineers, adapting basic developments to specific industrial problems. Perhaps this experience can be usefully applied in *your* plant. It is available on request. Ask for Bulletin 311 showing application of an all electric adjustable speed drive for A. C. circuits.

RELIANCE ELECTRIC & ENGINEERING COMPANY 1088 Ivanhoe Road • Cleveland 10, Ohio

Birmingham • Boston • Buffalo • Chicago • Cincinnati • Detroit • Greenville (S. C.) • Houston • Los Angeles • Minneapolis • New York
Philadelphia • Pittsburgh • Portland (Ore.) • St. Louis • Salt Lake City • San Francisco • Syracuse • Washington, D. C. • other principal cities



There's one "slow-down" that actually *speeds* production. It is easily made a function of Reliance Motor-Drive. Useful for set-up operations, threading, color matching, inspection, safety. Just press a button and—do it electrically.



RELIANCE^{A.C.}_{D.C.} MOTORS



NICKEL AIDS THE AUTOMOTIVE INDUSTRY *to KEEP 'EM ROLLING!*

Using ingenuity and "know-how" born of long experience, automotive engineers designed the phenomenally successful transport equipment that now speeds the United Nations on the road to Victory.

Built to take punishment far above peacetime requirements, these specialized military vehicles are being produced in quantity by the mass-production methods that have amazed the world. From North Africa to the South Pacific, these trucks, jeeps, tanks and half-tracks have repeatedly met demands for stepped-up performance.

This kind of engineering-thinking pioneered the application of Nickel alloyed materials. Now, when uninterrupted operation is so vitally impor-

tant, the widespread use of Nickel is clear evidence of its many advantages.

In steering knuckles or differentials, in forged gears or cast blocks, a little Nickel goes a long way to provide essential dependability. It improves strength/weight ratios, increases wear and corrosion resistance, imparts toughness, and assures uniform properties of the metals with which it is combined.

Today, maintenance crews on far-off battle fronts are learning what metallurgists and engineers here long have known... that, properly used, Nickel aids to "keep 'em rolling."

For years the technical staffs of International Nickel have been privileged to cooperate with automotive engineers and production men... men whose

work is now so necessary to the Nation. Counsel, and printed data about the selection, fabrication and heat treatment of ferrous and non-ferrous metals is available upon request.

New Catalog Index

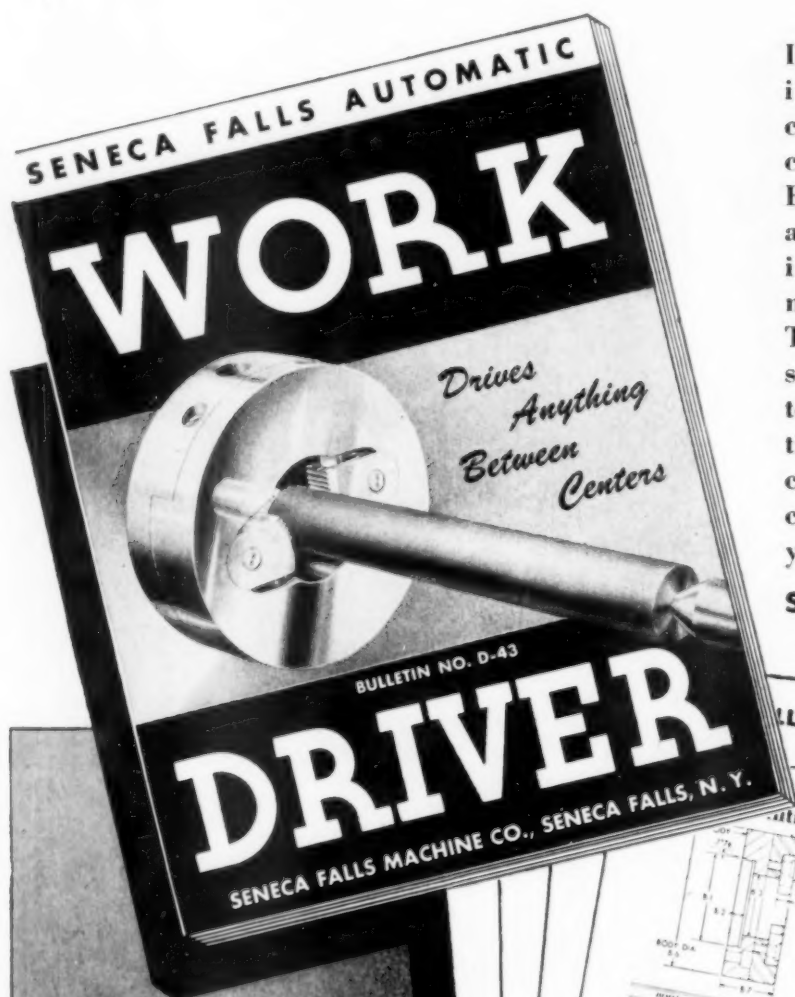
New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects—from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?



★ *Nickel* ★

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall St., New York 5, N. Y.

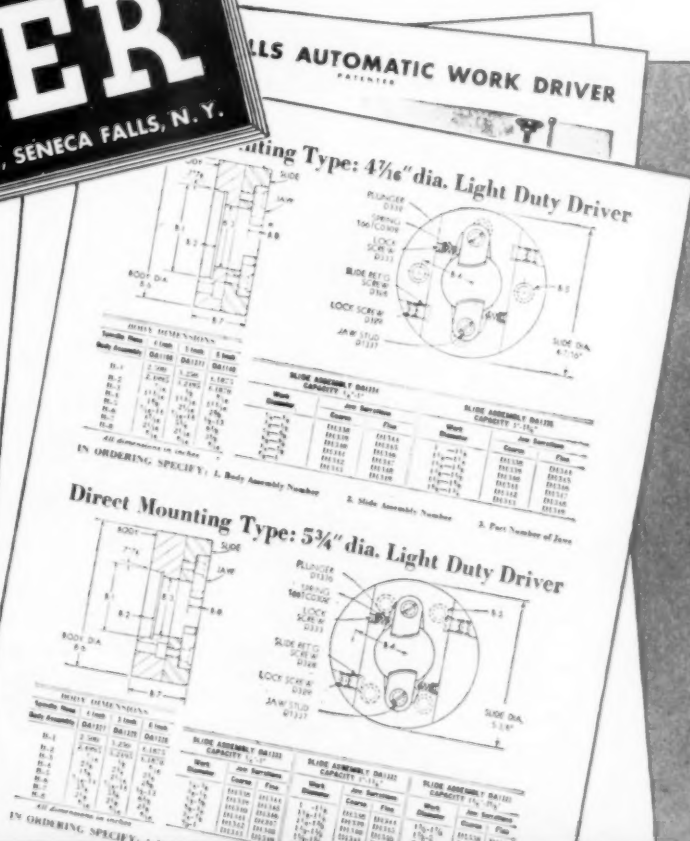
This catalog will help you SPEED UP BETWEEN-CENTERS WORK



If your manufacturing operations involve turning work between centers, write for your copy of this comprehensive catalog of Seneca Falls Work Drivers. It illustrates and provides complete engineering data on eighteen standardized models now available from stock. These proven time and labor-savers no longer need be made to individual customer's specifications. You will find a standard unit cataloged that will meet your specific requirements and help speed your war production.

SENECA FALLS MACHINE CO.
Seneca Falls, N. Y.

TYPICAL PAGES
FROM OUR WORK
DRIVER BULLETIN
*Send for your copy
TODAY!*



LATHE NEWS from SENECA FALLS

New *SPEED*...

New *PRECISION*

FOR SMALL THREADED WORK

THE ECONOMIES of the Circular Chaser principle—exclusive with National Acme—are now available to producers of small threaded parts, with the new

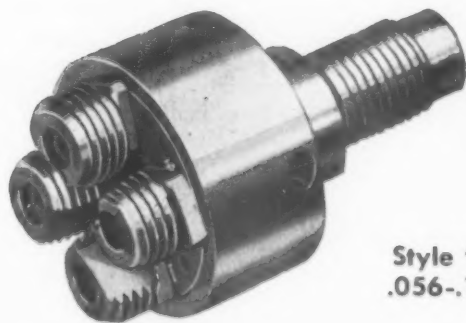
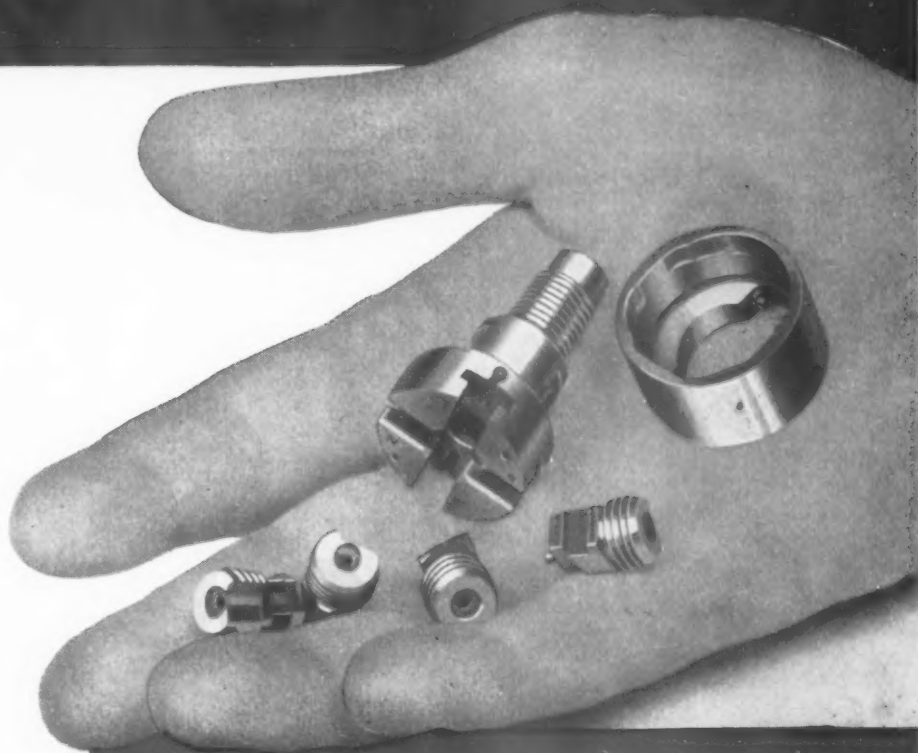
NAMCO "DA"

SOLID ADJUSTABLE DIEHEAD

With only three parts, simple and rugged in construction, this handles work from .056" to .1875" in diameter, pitches 10 to 20.

One adjustment brings all chasers to fine diametric precision, and they hold to the rigid standards of Class 3 threads. Chasers may be reground through 270° circumference—they last 20 to 50 times longer.

If you cut small diameter threads, the new "DA" is the tool you need. Catalog D 42-A.



Style "DA"
.056-.1875"

THE NATIONAL ACME co.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

Name Your Toughest Finishing Job . . . ONE OF THESE SKILSAW TOOLS will do it FASTER, BETTER, EASIER!

If your problem is grinding down heavy weld beads, smoothing off a thick braze, or removing heavy burrs . . . a SKILSAW Portable Grinder will speed the work. If it's cleaning off spot welds, removing rust or scale, or polishing a curved surface . . . one of these SKILSAW Disc Sanders will do the job better. Or if it's final-finishing on flat surfaces of any material . . . you can depend on a SKILSAW Belt Sander to do it easier.

These SKILSAW Disc Sanders, Belt Sanders and Portable Grinders, like all SKILSAW TOOLS, are built to stand the gaff. They're powered for extra fast work . . . they're streamlined, compact, lighter for easier handling . . . and they're better-built throughout for trouble-free performance longer . . . at a lower cost.

Judge for yourself . . . ask your distributor for a demonstration of SKILSAW TOOLS on your own work today!

Planning for After-the-War?

Let Skilsaw Field Engineers help you now to plan "tooling-up" for peacetime production, with Skilsaw's new post-war tools.



SKILSAW, INC.

5033-43 Elston Ave., Chicago 30, Ill.

Sales and Service Branches in All Principal Cities

SKILSAW DISC SANDERS

- Speed all finishing on flat, concave or convex surfaces of all materials. Used with wire brushes, grinding wheels, sanding discs or felt rubbing pads.

SKILSAW BELT SANDERS

- Do all sanding and finishing on flat surfaces of metal or wood. Light in weight, powerful, perfectly balanced for smoother, faster, easier surfacing on all operations.

SKILSAW Portable Grinders

- Best tool for grinding down heavy welds, studs, rivets and bolts. Ball bearing construction absorbs spindle thrust, assures smoother, vibrationless work.

SKILSAW PORTABLE ELECTRIC **TOOLS**

MAKE AMERICA'S HANDS MORE PRODUCTIVE



is it possible to build a rat?

IN the answer to this extraordinary question is a curious story. For two scientists once posed that very question to themselves . . . and the answer was Yes!

They actually built a machine with the power to "learn" by experience and "remember" what it had learned—a mechanism capable of simulating the rudimentary behavior of a rat. Comprised of solenoids, gears and relays, it traveled a grooved track forked by 12 dead-end side-tracks—equivalent to the blind alleys which a living rat encounters. Set to take the dead-end forks, as if by an inner compulsion, this robot rat literally learned by experience to avoid the frustrating blind alleys, in a perfect mechanical analogue to the conditioned reflexes of the brain.*

To build a machine that would reproduce *all* the behavior of a rat "would require a mechanism probably as large as the Capitol at Washington"—*but it could be done!*

For we're at the beginning of an amazing new technological age. Already there are many kinds of thinking machines in our incredibly mechanized world, helping to speed production, cut costs and build better products. And intimately a part of this whole story is the science of machine tool engineering.

Today, Jones & Lamson engineers are working with the leading manufacturers in virtually every industry, helping them to plan production *now* for the machines and the products of tomorrow.

They are at your service, too.

* In "The Advancing Front of Science" by George W. Gray, a memorable chapter on thinking machines reports this story in full.

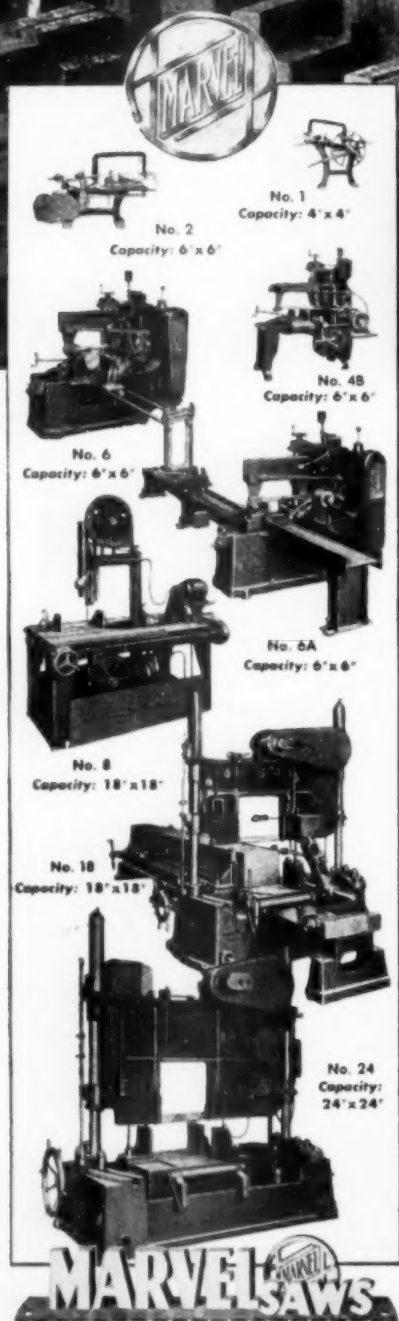
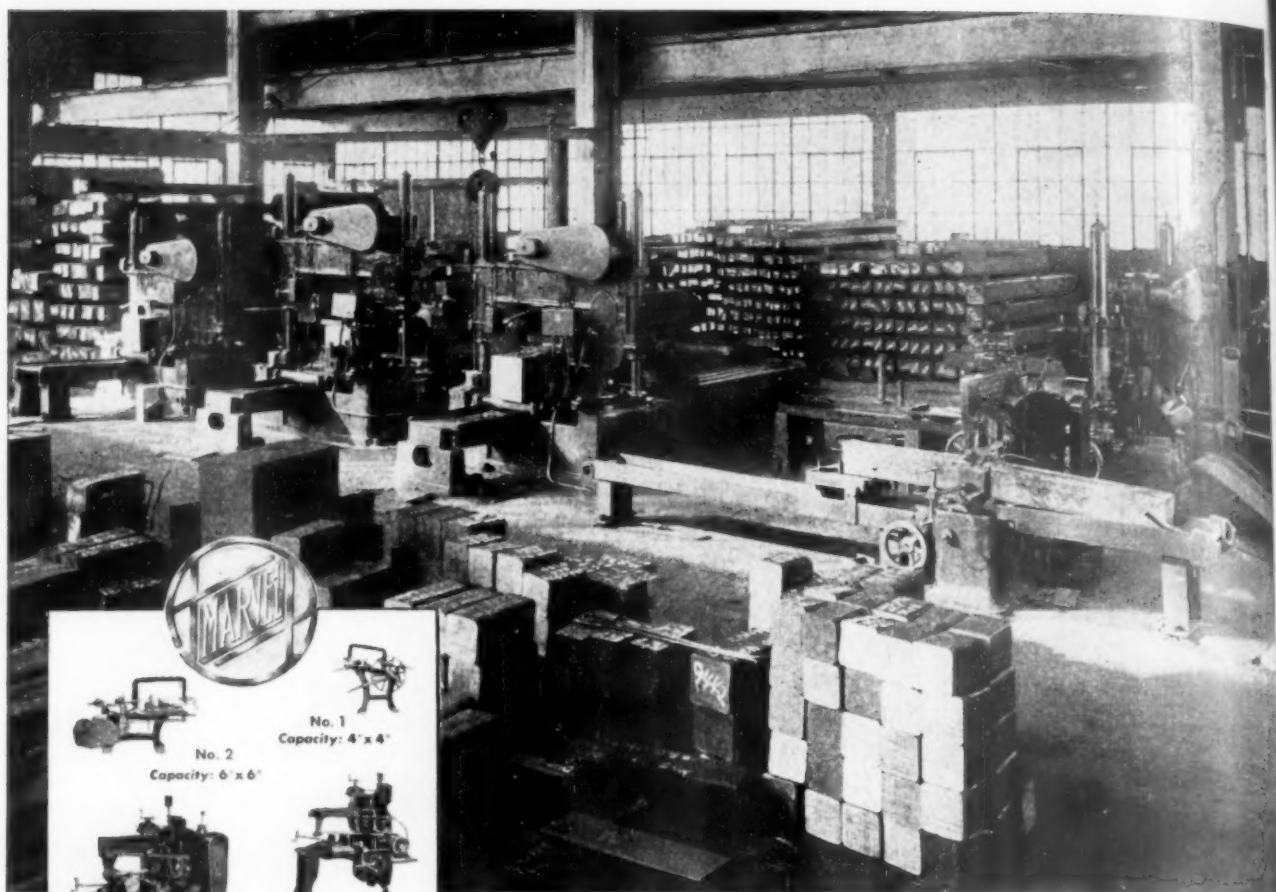


JONES & LAMSON

MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A. **Profit-producing Machine Tools**

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.



2 MEN NOW DO THE WORK OF 4 AND SAVE FORGING STEEL TOO

The Ajax Steel & Forge Company, Detroit, has solved its cutting-off problems with a battery of MARVEL Saws. Before, billets were cut-off with a hammer—an operation which not only required at least four men and tied up hammers and furnaces, but also resulted in the waste of a great deal of forging steel.

Now two operators with seven MARVEL Saws supply the entire plant with billets cut to exact size from bars up to 18" x 18" square. In addition to their present MARVEL Saws, five of which are illustrated above, this company is adding a super-giant MARVEL No. 24 Hydraulic Hack Saw—the new mammoth saw that quickly cuts-off the toughest steels in sizes up to 24" x 26" cross section.

Our local Marvel Sawing Engineer will gladly call at your plant, study your metal cutting problems and make recommendations as to methods and equipment. Write for new Catalog.

BUY FROM YOUR LOCAL DISTRIBUTOR

ARMSTRONG-BLUM MFG. COMPANY

"The Hack Saw People"

5700 Bloomingdale Avenue

Chicago 39, U. S. A.

Eastern Warehouse & Sales: 225 Lafayette St., N. Y.

THE TOOL ENGINEER

A Long Way in a Short Time

★ EX-CELL-O OFFICE AND
MAIN PLANT TODAY



★ EX-CELL-O AIRCRAFT
PARTS DIVISION

The First
EX-CELL-O PLANT

DURING ITS FIRST 25 YEARS

EX-CELL-O HAS MADE "PRODUCTION" HISTORY FOR THE NATION

Ex-Cell-O was founded a quarter of a century ago with a practical ideal—to bring to metal-working industries a new high standard for accuracy and speed in mass production. Steadfastly through the years it has progressed in this direction. Ex-Cell-O was the first company in the United States to design and manufacture and introduce for successful commercial use: a precision ball bearing internal grinding spindle . . . a precision horizontal-type diamond boring machine . . . a precision thread grinding machine . . . a precision cylinder

boring machine . . . a 1½ horsepower compact hydraulic power unit . . . a Diesel fuel injection pump and a universal-type Diesel engine nozzle . . . a machine to form and fill automatically square paper milk bottles in the dairy . . . Ex-Cell-O was also the first American company to undertake the mass production of hardened and ground precision parts for airplane engines. If you are planning for tomorrow, when new standards will necessitate costs that are competitive, take advantage of Ex-Cell-O's wide engineering experience and extensive manufacturing facilities.

EX-CELL-O CORPORATION • DETROIT 6



★ EX-CELL-O MACHINE
TOOL DIVISION



★ EX-CELL-O
DIESEL DIVISION

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • BROACHES AND BROACH GRINDING MACHINES • HYDRAULIC POWER UNITS • GRINDING SPINDLES • DRILL JIG BUSHINGS • CONTINENTAL CUTTING TOOLS • TOOL GRINDERS • DIESEL FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PURE-PAK PAPER MILK BOTTLE MACHINES • PRECISION AIRCRAFT AND MISCELLANEOUS PARTS

MAGIC TYPE *Quick Change* CHUCKS



BUILT FOR SPEED . . .

Change tools in your Drill Presses, Turret Lathes, and Boring Machines without stopping the spindles ... Save set-up time and add many stations to your machines by using Magic Quick Change Chucks.

By simply raising the locking ring, the centrifugal force throws two balls out of position, permitting the collet to drop out automatically.

Collets of various types can be furnished to accommodate Drills, Reamers, Boring Bars, Counterbores, Core Drills, Taps and Special Tools.

Our Tool Engineers will gladly assist you in adapting Magic Quick Change Drives to your production problems. Send us sketches or blue prints for recommendations and quotations.

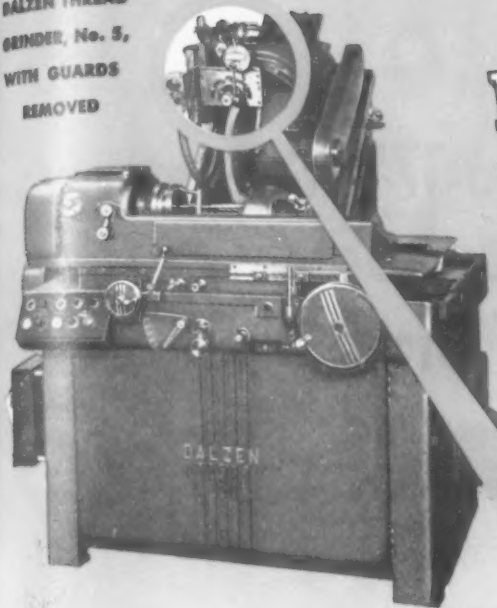


Scully-JONES

AND COMPANY

1901 SOUTH ROCKWELL STREET • CHICAGO, U. S. A.

DALZEN THREAD
GRINDER, No. 5,
WITH GUARDS
REMOVED



IN THREAD GRINDING... THE DRESSER'S THE THING!

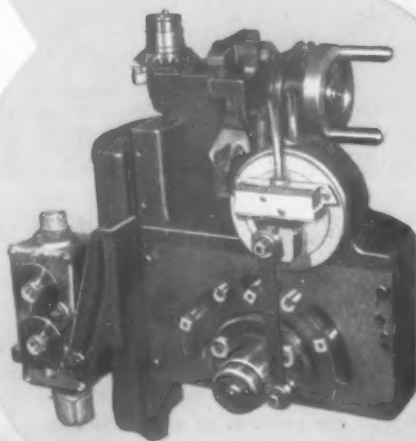
AUTOMATIC DRESSING IS PROVIDED IN THIS
New DALZEN Electronic THREAD GRINDER

● Accuracy of a ground thread depends upon the accuracy of the dressed wheel. Precision, finish and production efficiency in thread grinding are determined primarily by the dresser.

DALZEN engineers always have recognized this fact. Now . . . the new DALZEN Electronic Thread Grinder presents the latest and best in dresser efficiency—offering new and special advantages in dressing performance.

The new DALZEN Thread Grinder with General Electric Thy-mo-trol drive provides maximum production of threaded parts, thread gages, straight and spiral fluted taps, and thread milling cutters. Grinding speed—both wheel and work—forward and reverse—is adjusted by the twist of a dial. Variation is infinite and stepless. It's an investment in better thread grinding, and a low-cost investment at that!

An attractive three-color folder describing the new DALZEN Models 5 and 6 will be sent you, free of charge, on request.



DALZEN

TOOL & MANUFACTURING COMPANY

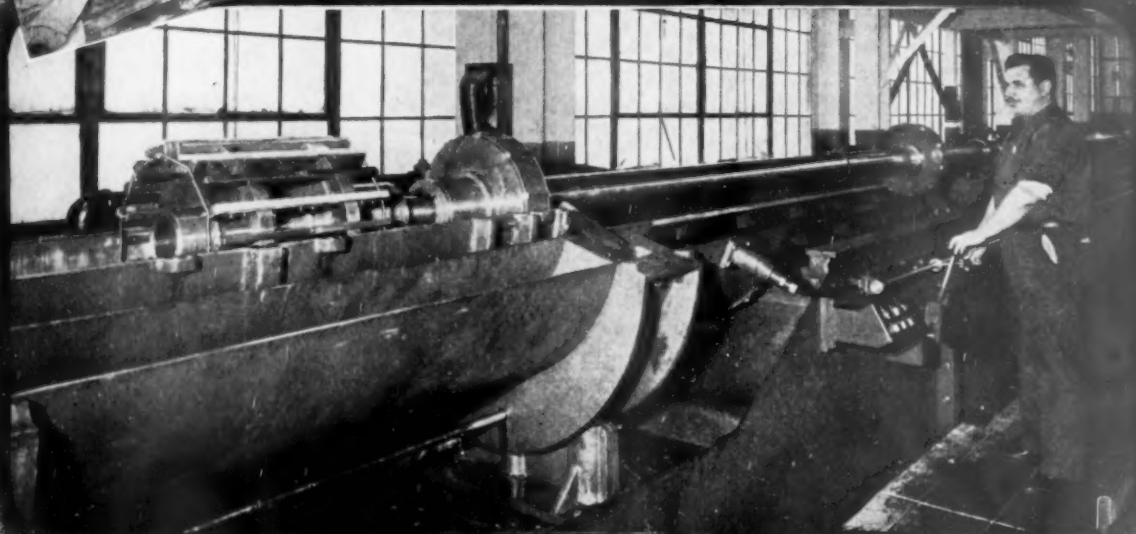
12255 EAST EIGHT MILE ROAD

• DETROIT (5), MICH.

(Below) **BARNESDRIL** No. 30 Horizontal Honing Machine for honing large diameter bores.



**Honing a 17½" Diameter by
20 Ft. Long Bore with .030"
to .040" Stock Removal...**



BARNESDRIL Honers for Any Bore up to 42" Diameter and Lengths to 75 Feet

These large chrome molybdenum alloy forging cylinders, 17½" in diameter and 20 feet long, are honed on a No. 30 **BARNESDRIL** Horizontal Honing Machine with a 50-foot working stroke. The honing operation produces a mirror finish with the removal of only .030" to .040" of stock. This manufacturer also uses this machine for honing larger cylinders by adapting a 41½" hone on the same machine.

Honing is Adaptable to Any Bore

To meet any of your finishing requirements, **BARNESDRIL** Honers are made in a wide range of sizes to handle work up to 42" in diameter and lengths to 75 feet or longer. These **BARNESDRIL** Honing Machines are made in vertical, horizontal, and angular types, with one or more spindles. External surfaces can also be finished

with excellent results by conventional or co-directional honing.

How to Select the Proper Machine for Your Job

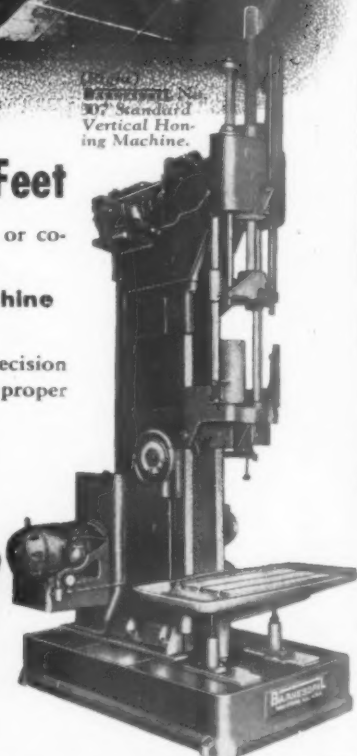
Let **BARNESDRIL** Engineers, experts in precision finishing methods, help you select the proper type and model of honing machine for your specific production requirements. Just send blueprints of parts for analysis and recommendations. There is no obligation.

FREE HONING DATA

Here is a valuable booklet with complete details of the Honing Process and the complete line of **BARNESDRIL** Honing Machines. Write for free copy —Bulletin No. T-121.



(Below) **BARNESDRIL** No. 30 Vertical Honing Machine.



Barnes Drill Co. 848-71 CHESTNUT STREET
ROCKFORD
ILLINOIS, U. S. A.

GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING

**Tracer Control
SAVED 120 HOURS**
Duplicating Eight (8)
Die Molds for *Plastics*

8 Dies Duplicated from 1 Original Master
ON THIS TYPICAL JOB that previously took 40 hours per die—the Gorton Duplicator gave this manufacturer a Tracer-Controlled machining method that saved 15 hours' actual machining time per die in the production of 8 die molds for plastic handles. Simplicity of setups and Gorton improved finish which eliminated any hand finishing operations brought additional savings.

You will find the Gorton 8 $\frac{1}{2}$ -D Duplicator the ideal machine tool for all kinds of die and mold work, capable of duplicating any part accurately with extremely fine finish. On many war jobs today, Gorton Duplicators are paying for themselves in savings effected.

PRODUCTION DATA

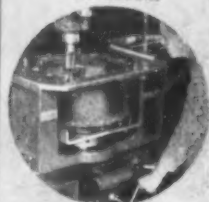
Material—Machine Steel.
Operation—Duplicating Die Molds for Plastic Handles.
Speed—Roughing, 500 r.p.m.
Finishing, 1100 r.p.m.
Time—25 Hours per Mold, Floor-to-Floor.
Holding Method—Simple Table Vise.
Accuracy—.001" with Extra Fine Finish.
Savings with Tracer Control—15 Hours per Die —
Total Savings—120 Hours per 8 Dies.

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There is a "Tracer-Control" solution to your machining problem. Submit it to Gorton engineers who have had more than 50 years of practical experience in the development of Tracer-Controlled Milling. Call on your nearest Gorton Dealer, or write to the Gorton factory at Racine, Wisconsin.



The Right Size
The Right Type
of Machine
for Every Job...
From 2 oz. to 2 ton
DIE BLOCKS



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MILLING



Tracer-Controlled
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Tracer-Controlled
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Duplicators



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*True-fit
Super-tough
Socket*

COLD-FORGED
to concentrate **STRENGTH**
where strains are greatest

PARKER-KALON SOCKET SCREWS

PARKER-KALON rules out socket trouble. First - by *cold-forging* to concentrate dense, tough metal where the strains are greatest. Second - by unequalled Quality Control over all physical and mechanical characteristics.

P-K's Quality-Control routine starts when the raw material enters the Parker-Kalon plant, and continues until the finished screws are

packed. Tests and inspections cover Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Torsion and Shear; Hardness; Head and Socket Size and Position; Thread Fit.

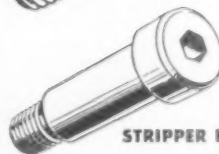
Socket Screw users need this protection today more than ever. Specify "Parker-Kalon" next time you order, it costs no more. Parker-Kalon Corp., 208 Varick St., New York 14, N. Y.



SET SCREWS



CAP SCREWS



STRIPPER BOLTS



PIPE PLUGS

A Product of PARKER-KALON--Specialists in Fastening Devices

HONING helped create "400" Aviation



The tactical need for outflying our enemy has crowded military aviation into the "400" bracket, as may be seen in the comparison below:

	WORLD WAR I	WORLD WAR II
Speed	130 MPH	400 MPH
Period Between Engine Overhauls	40 Hours	400 Hours
Tactical Ceiling	12,000 Feet	40,000 Feet
Engine HP	125 HP (Liberty)	2,000 HP

This amazing advancement has been accomplished largely by better engineering design, better metallurgy and better controlled machining. Microhoning provides one of the most important machining controls by assuring maximum quality and safety in the bearing surfaces of our military and naval plane engines and other plane mechanisms.

Bearing bores and other critical surfaces are finished by Microhoning—the modern abrading process which removes stock at rates up to 65 cubic inches per hour, generates accuracy for roundness and straightness of bore within .0002" to .0003" and any desired surface finish.

Better planes for war mean better planes for the peace to come.

Some Microhoned Aircraft Bores

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Master Con Rod (all bores)
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Piston Pin Bores
Valve Guide Bores
Pinion Gear Bores
Oleo Cylinder Bores
Brake Cylinder Bores
Gun Turret Hydraulic
Cylinder Bores and
many other parts



M I C R O M A T I C H O N E C O R P O R A T I O N
DETROIT, MICHIGAN

Machine tools give meaning to this

jury's verdict!



It wasn't much of a story. By news standards today it was strictly Page 14. The night City Editor slugged it "delinquent—local" and the man in the slot gave it a one-column head. **JURY BLAMES SLUMS FOR JUVENILE CRIME.**

"Health stations, more hospitals and schools, recreational and training facilities, low-cost housing projects and community centers were recommended by the grand jury, in its final presentment yesterday, as measures to check the rising tide of juvenile delinquency in this etc., etc., etc."

Few people read it. In the midst of war and politics, it was strictly Page 14.

That's why we're running it. Because that story should be a Page 1 **MUST** in every city in America. Because that jury's verdict is a *national* challenge. Because it gives the lie to every brand of private or political complacency which turns away from one simple, unvarnished truth: Our sons are fighting for a better world than they left behind—and total victory is a long way off!

What has the machine tool industry to offer here? One very real contribution: The engineers of the basic machine tool producers have helped the men of government and of industry to plan the most desperate and gigantic production program of all time . . . and they can help those same men in planning today for the peace that must be won after the war is won!

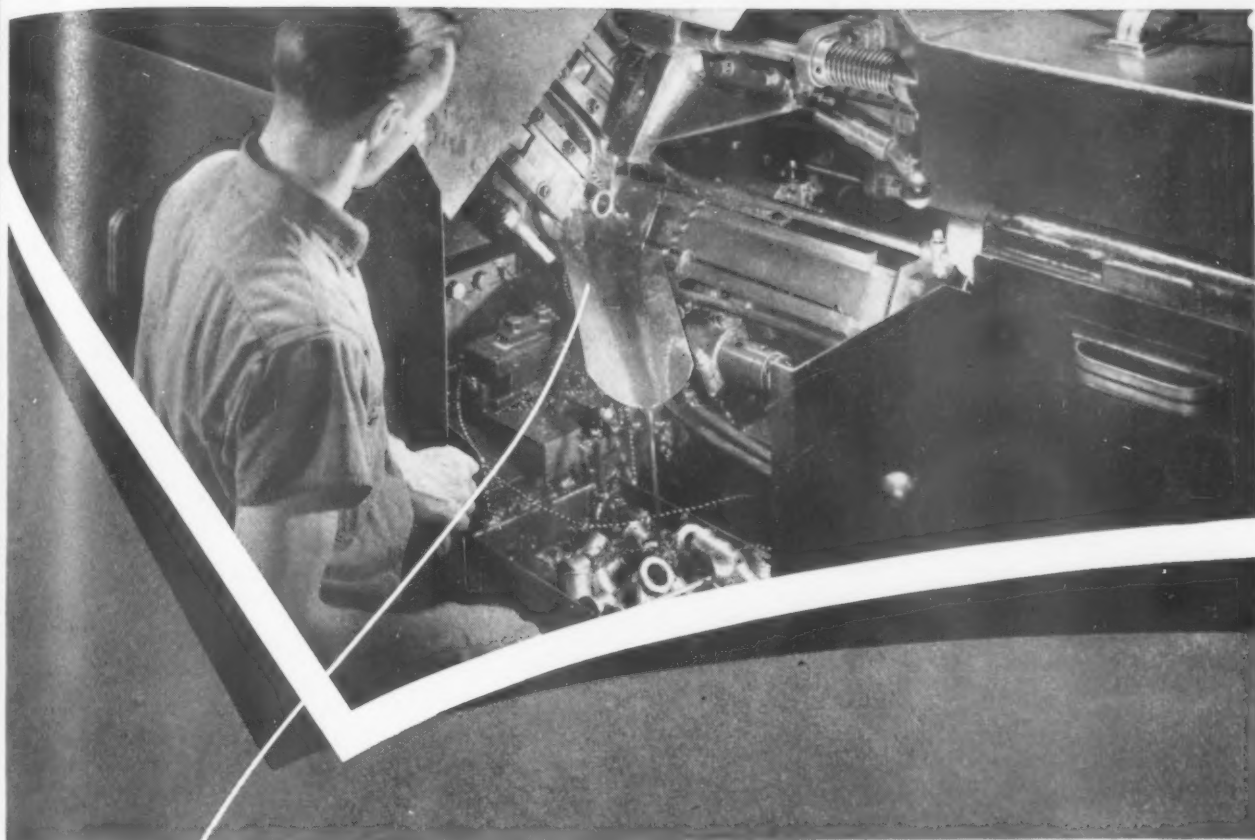
One of these is a Bryant man. We invite you to send for him.



Bryant Chucking Grinder Company

SPRINGFIELD, VERMONT, U.S.A.

THE TOOL ENGINEER



Superior properties of Gulf Cutting Oils point to improved production and tool life in your shop

Every Gulf Cutting Oil has specific properties which insure better performance on certain types of cutting jobs—probably the kind of jobs you have in your plant!

Gulf Lasupar and Gulf Electro cutting oils, for example. The sulphur in these oils is combined by an exclusive Gulf process so that it is uniquely active over a wider range of temperatures in a cutting operation. This is mighty important in controlling temperatures and insuring precision

work, for the advantages derived from the sulphur in cutting oils are governed more by the amount of chemically active sulphur present than by the total percentage of sulphur.

Call in a Gulf Service Engineer today and ask him to show you how Gulf Cutting Oils can help improve machine shop efficiency. For your copy of the booklet on Gulf Cutting Oils—which includes a helpful 45-page machining guide — send the coupon below.

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Gulf Building, Pittsburgh 30, Pa.



Tools are weapons . . .

treat 'em right

JUNE, 1944

Gulf Oil Corporation—Gulf Refining Company
3800 Gulf Building, Pittsburgh 30, Pa.

TE

Please send me, without obligation, a copy of the booklet, "Gulf Cutting Oils," which includes a 45-page Machining Guide.

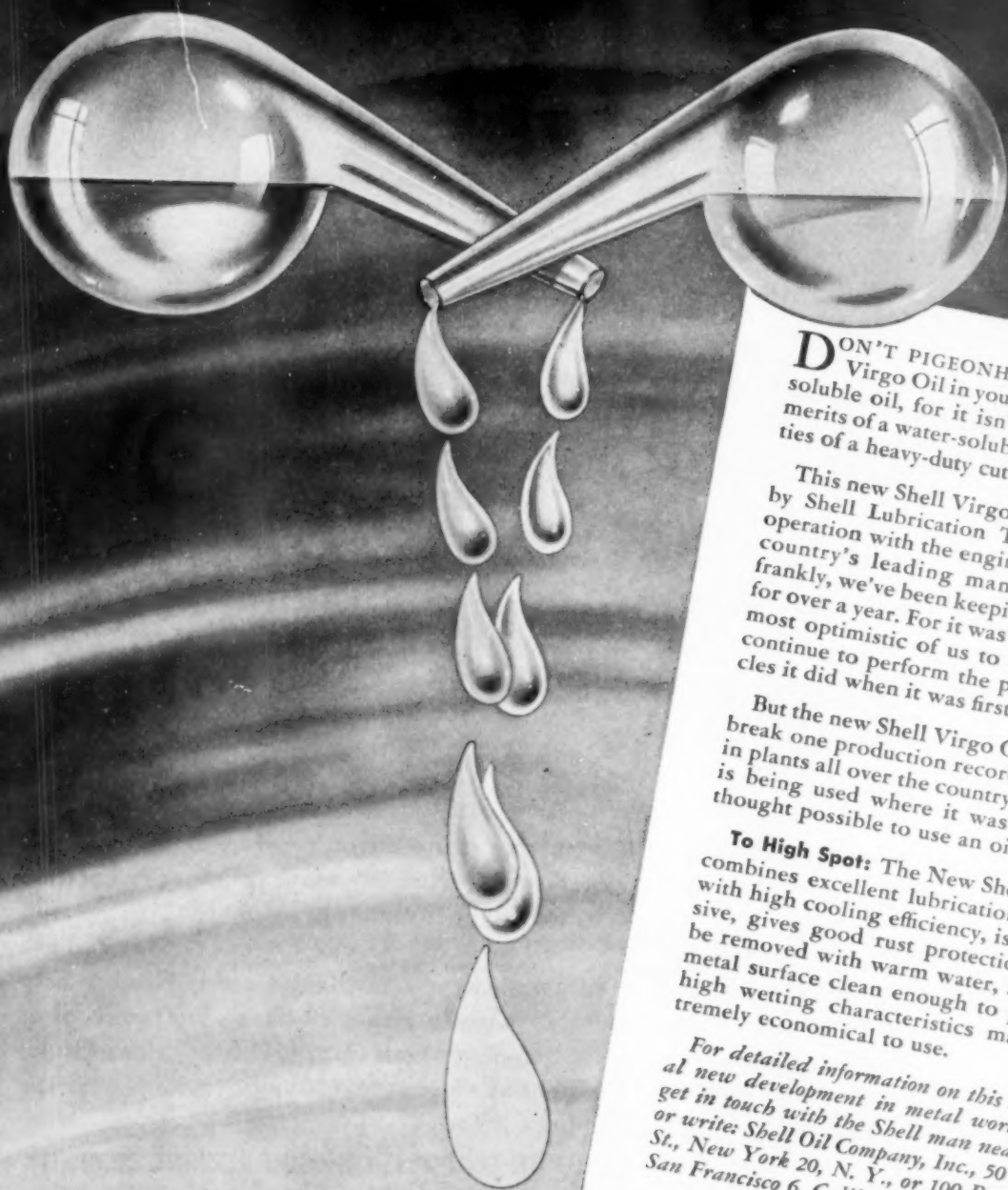
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NOW A SENSATIONAL NEW CUTTING OIL THAT'S **WATER SOLUBLE!**



DON'T PIGEONHOLE this new Shell Virgo Oil in your mind as just another soluble oil, for it isn't. It contains all the merits of a water-soluble oil, plus the qualities of a heavy-duty cutting oil.

This new Shell Virgo Oil was developed by Shell Lubrication Technicians in co-operation with the engineers of one of the country's leading manufacturers. And, frankly, we've been keeping it under wraps for over a year. For it was hard for even the most optimistic of us to believe it would continue to perform the production miracles it did when it was first developed.

But the new Shell Virgo Oil continues to break one production record after another in plants all over the country. This new oil is being used where it was never before thought possible to use an oil of this type.

To High Spot: The New Shell Virgo Oil combines excellent lubrication properties with high cooling efficiency, is non-corrosive, gives good rust protection and can be removed with warm water, leaving the metal surface clean enough to paint. The high wetting characteristics make it extremely economical to use.

For detailed information on this sensational new development in metal working oils, get in touch with the Shell man nearest you, or write: Shell Oil Company, Inc., 50 W. 50th St., New York 20, N. Y., or 100 Bush Street, San Francisco 6, California.



A NEW

SHELL VIRGO OIL



JARVIS

ROTARY FILES

TUNGSTEN CARBIDE
GROUND from the SOLID

In line with the growing use of Tungsten Carbide tools, the Charles L. Jarvis Company has developed over the past few years a Ground-from-the-Solid Tungsten Carbide file which, from past experience, has proven to be extremely economical wherever standard High Speed Steel Ground-from-the-Solid Rotary Files are used.

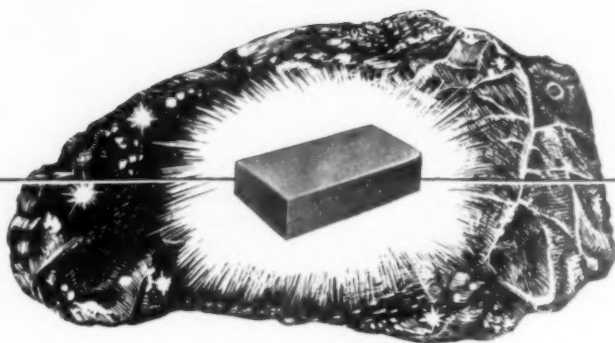
It is possible to make extreme claims as to the life and cutting speed of these new type rotary files and experience has proven that if these tools are carefully salvaged for regrinding, the rotary file costs can be cut to a fraction of the High Speed Steel files.

Send For New Catalog

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES
QUICK CHANGE CHUCKS AND COLLETS

WORLD'S
FINEST
CARBIDE



QUALITY CONTROL

FROM ORE TO FINISHED PRODUCT

Shop superintendents throughout America's metal-working plants can tell you that steel-cutting time is saved and superior results are obtained by Vascoloy-Ramet Carbide Tools.

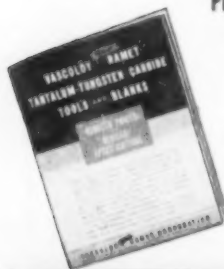
"Vascoloy-Ramet" was the *first* successful cemented Carbide developed for machining steel. It has been painstakingly maintained as the *number-one quality* by *complete control* of processing Tantalum-Tungsten Carbides from the crude ore to the finished product.

Vascoloy-Ramet Corporation and Fansteel Metallurgical Corporation (world's foremost producers of Tantalum) work hand in hand, to maintain the quality of the world's finest Carbide. Advanced methods of manufacture have now lowered the cost to the user!

Tools are now supplied in two finishes, Unground and Finish Ground. Unground Tools have all the angles and clearances formed and are very practical for shops having the equipment to grind their own tools. Unground Tools offer a substantial saving in cost. Finish Ground Tools are ready for use and are the finest quality tools known to industry.

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PRICE LIST
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If you are not getting maximum machining efficiency in minimum cutting time, try Vascoloy-Ramet Tantalum-Tungsten Carbide Tools.



VASCOLOY  **RAMET** CORPORATION

VASCOLOY-RAMET CARBIDE TOOLS AND TANTUNG CAST ALLOY CUTTING TOOLS

NORTH CHICAGO • ILLINOIS
DISTRICT SALES & SERVICE IN PRINCIPAL CITIES

Only
20 MILLIONTHS
 of an inch
 clearance between
GAGE and HOLE



**But there's no sticking or
 jamming...no time lost...
 no gages spoiled**

The nose of PM PILOT GAGES is chamfered and finished with an annular groove—to make application easier and simpler in tight holes or blind holes.

Insert one side of the gage, at a slant, straighten up, and the gage slides smoothly into the hole without forcing, sticking or jamming.

Work goes faster, gages last longer with maintained accuracy, and there's no spoiled work.

Standard size PM Pilot Gages are stocked—for prompt shipment.



The PIPE MACHINERY COMPANY Cleveland, O.



Here's what others have to say about cold treating with **Deepfreeze**

A PROMINENT MANUFACTURER OF MILLING CUTTERS says, "By cold treating cutters in a Deepfreeze machine at -120°F . for two hours, we have increased cutter life from 7 to 24 hours per grind."

A BROACH MANUFACTURER writes, "After cold treating high speed burnishing broaches at -120°F . for three hours, an increase of from 216 to 648 pieces per grind was obtained."

A MANUFACTURER OF PRECISION GAUGES states, "We have been able to minimize expansion in precision gauge blocks by treating them in Deepfreeze Industrial Cold Treating Machines. This stabilization eliminates costly metal growth and warping which formerly destroyed accuracy."

A MANUFACTURER USING DEEPFREEZE FOR SHRINK FITS comments, "The Deepfreeze Cascade -120°F . Industrial Chilling Machine saves us from \$3000 to \$4000 per month over use of liquid air in assembling piston bushing."

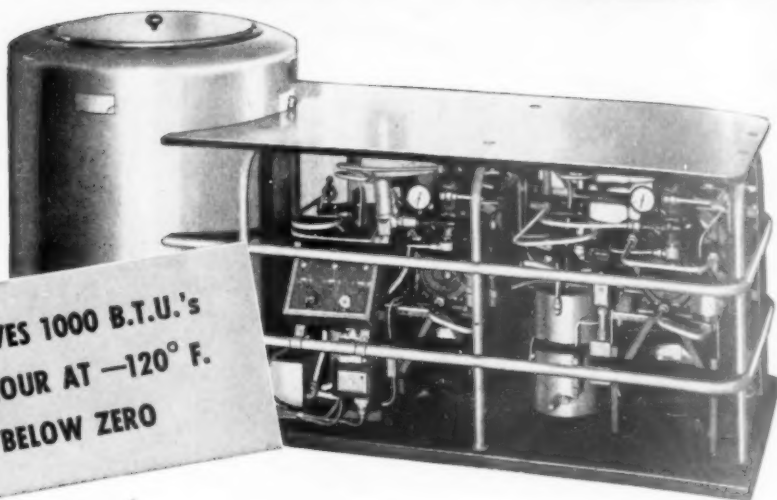
**For More Proof of
Deepfreeze Savings
Get this
FREE Booklet**



Prompt Delivery

You can do more than talk Deepfreeze... you can get Deepfreeze now. If you are a producer of essential wartime products and can qualify under government priority regulations, we can promptly supply you with a Deepfreeze Industrial Chilling Machine. The sooner you place your order, the quicker your production will benefit.

HOW CAN I USE THE NEW *Deepfreeze* PROCESS OF COLD TREATING IN *MY* PLANT?



REMOVES 1000 B.T.U.'s
PER HOUR AT -120°F .
BELOW ZERO

Of course the specific answer to this question is entirely dependent upon the type of products being manufactured in your plant and your manufacturing process, but we can answer it in part by telling you briefly how the Deepfreeze Cold Treating Process is being used in other plants.

Your work might be similar. Take the following few examples for instance:

Manufacturers are using Deepfreeze Cold Treating as a supplement to heat treating to secure greater hardness and more uniformity of structure in machine parts.

Tool manufacturers and tool users are obtaining remarkable increases in tool life by cold treating high speed cutting tools in Deepfreeze Industrial Chilling Equipment. Increases in tool life of as much as 500% have been reported by many tool users.

Manufacturers of precision instruments and gauges are using the Deepfreeze Cold Treating Process to age products and stabilize dimensions. This quick-aging of steel by chilling eliminates costly material growth and warp by holding the finished sizes under

all normal temperature changes and handling.

Aircraft manufacturers are using Deepfreeze Cold Treating to test all types of flying instruments and accessories in order to predetermine their reactions to the atmospheric conditions they will encounter in flight.

Manufacturers in general are using Deepfreeze Cold Treating in the assembly of parts. Chilling for shrink-fit assembly not only increases production but eliminates costly rejects because of distortion and scoring prevalent in other methods.

Space limits the number of applications that can be presented here, but you can secure the complete story on Deepfreeze Cold Treating as well as the answer to the question "How to Use Deepfreeze Cold Treating in Your Plant" by dropping us a line. Let us know the type of work at which you are now engaged and we will point out the possibilities and advantages of utilizing cold treating in its production. This information is offered to you without cost or obligation.

The information contained in this booklet will give you a complete account of cold treating with Deepfreeze Industrial Chilling Machines. Whether you are acquainted with the Deepfreeze process of cold treating or not, you will find that the material included will give you the latest facts on the cold treating of metals. Write today for your free copy.

Deepfreeze

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE
Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

2311 DAVIS STREET,
NORTH CHICAGO, ILLINOIS

Division of Motor Products Corporation, Detroit, Mich.

Enclosed Design

- .. PROTECTS LATHE OPERATOR
- .. KEEPS VITAL PARTS CLEAN
- .. MAKES BELT CHANGING EASY

The operator does not catch fingers or clothing in moving belts or gears on a Logan Lathe. The Cone Pulley Guard in its normal "down" position completely covers the countershaft, headstock and back gear assemblies. The motor-drive belt and change gear assemblies are completely enclosed. All guards are quickly and easily opened giving complete accessibility. Not only is the operator protected, but vital parts of the lathe are shielded from dust and dirt accumulations.

Raised to its "up" position, the Cone Pulley Guard automatically moves the countershaft toward the headstock, releases flat belt tension, and makes changing the belt position easy and safe...an exclusive, patented Logan feature. The flat belt tension is easily and quickly regulated by a simple screw adjustment. Full information on all the advanced design features of all models of Logan Lathes will gladly be sent you on request. Write today for your copy of the latest Logan Lathe catalogs.

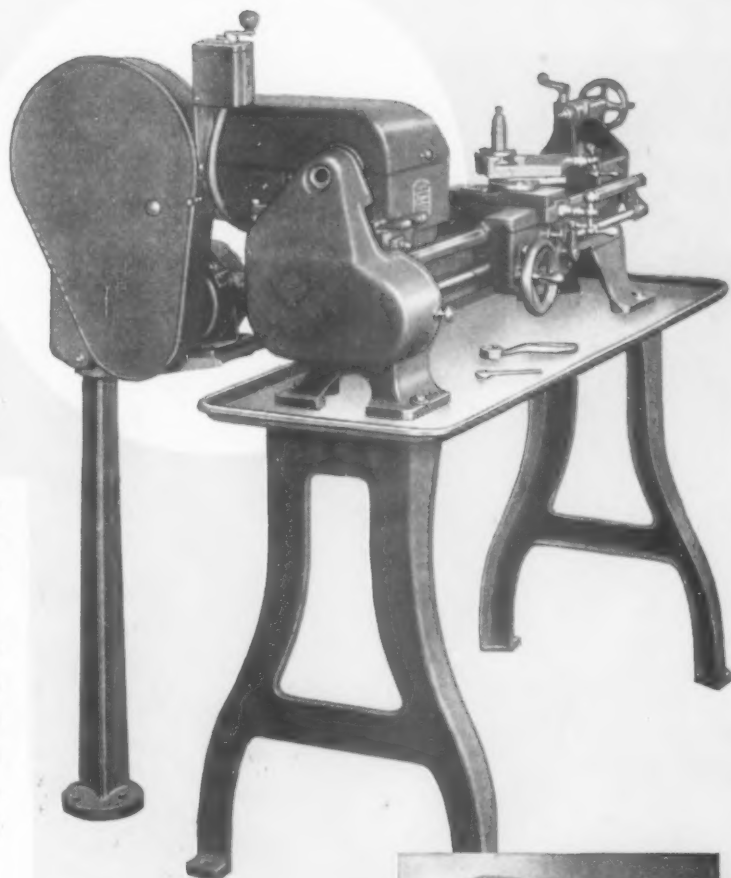
BRIEF SPECIFICATIONS

Swing over bed, 10½" . . . bed length, 43½" . . . spindle hole, 2½" . . . capacity, ¾" with push type collet . . . 6-position automatic indexing turret . . . stroke of turret, 4¼" . . . 12 spindle speeds from 30 to 1450 r.p.m. . . . all moving parts protected by ball bearings or self lubricating bronze bearings.



LOGAN ENGINEERING CO.
CHICAGO 30, ILLINOIS

*One of a series describing the finer features of Logan Lathes . . . Look for the next of the series

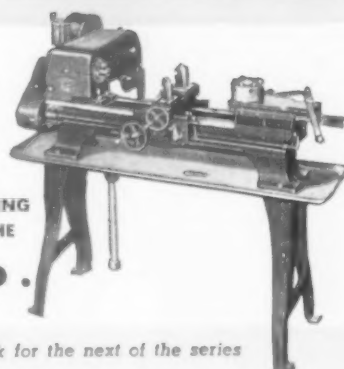


OPERATOR PROTECTED . . . VITAL PARTS KEPT CLEAN

Countershaft, back gears, headstock, change gears and motor-drive belt are all completely enclosed, yet quickly accessible.

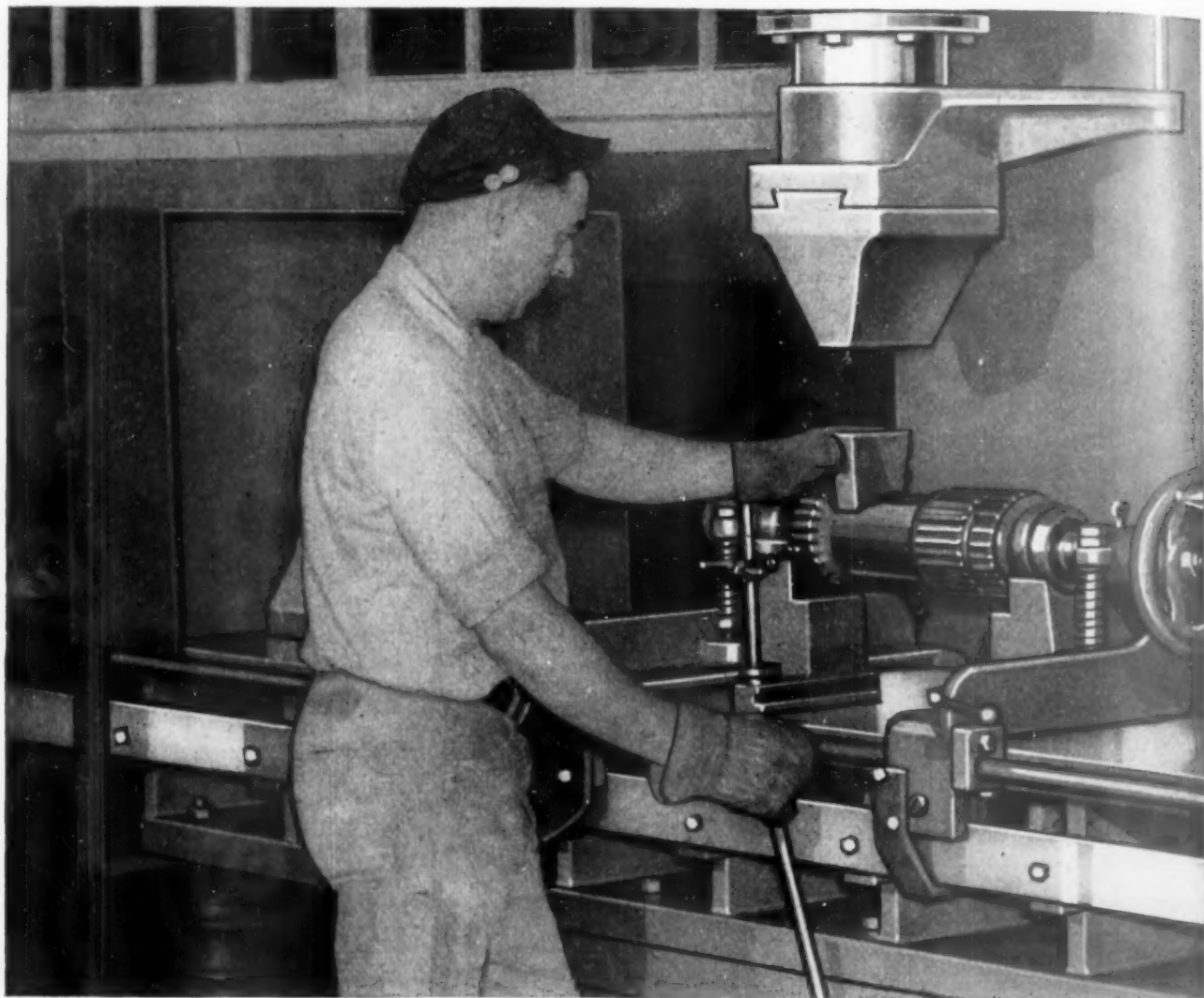
BELT CHANGES EASY AND SAFE

Raising the Cone Pulley Guard to "Up" position automatically moves the countershaft toward the headstock, releasing tension on the flat belt.



No. 850
MANUFACTURING
TURRET LATHE

A hundred-ton push...



100-ton Hannifin hydraulic press, with sensitive pressure control, at the plant of Mack Manufacturing Company

at a finger-tip touch for Mack Trucks

Fast, accurate straightening operations, as illustrated here, are but one example of the modern precision manufacturing methods behind Mack truck and military vehicle performance. This Hannifin 100-ton straightening press combines compact, self-contained, hydraulic press design with sensitive pressure control for fast, easy handling. This control gives the operator any ram pressure from a few pounds to full 100-ton capacity at a finger-tip touch. The control is so easy to handle that accurate straightening can be carried on at a consistently fast pace.

Hannifin hydraulic presses are built

in a wide range of standard types, and are being used by many producers of military vehicles, armament, aircraft, and machine tools. Standard models, 5 tons to 150 tons, can be readily modified to provide the table design, reach, gap, stroke and

ram speeds needed to meet individual needs. Write for descriptive bulletins, or consult Hannifin engineers for specific recommendations.



HANNIFIN MANUFACTURING COMPANY
621-631 So. Kolmar Ave., Chicago 24, Illinois

Hannifin

HYDRAULIC PRESSES

PRODUCTION PERSPECTIVES

T.M. REG. BY THE BRANSON PUBLISHING COMPANY

PRODUCTION PICTURE: Shifting tides of battle and the long-range plans promulgated by naval and military leaders control the pulse of industry, large or small. . . . WPB merely directs operations, keeps the tracks clear.

BREAKDOWN: Overall munitions production rose 3 per cent in March, ending a 3-month downward trend. . . . Still greater output in April, if anywhere near schedule, exceeded that for any previous month. . . . May schedules called for sharp rises in every category of fighting equipment: communica- tions, combat vehicles, ammunition, guns and aircraft.

ONE TROUBLE: Since almost all major material bottlenecks have been broken (see below), the only catch in "production planning" is manpower. . . . The new, clear-cut draft rules with leniency "over 30" reflects concern in Washington over the manpower problem.

OUTLOOK: Unless Hitler's Fortress Europe falls soon, you can discount all talk of early reconversion. . . . WPB has scheduled a 25 per cent rise in pro- duction by late summer of every critical fighting item. Aircraft leads the list, with no cutbacks in total output visualized this year. *

CUTBACKS: Most war production items except aircraft are expected to be cut-back by November. . . . A substantial decline by mid-year is certain in transport ships, destroyer escort vessels and ground Army ordnance items.

MATERIALS: Outcome of the U. S. war production effort once hung on the success of materials scheduling. Breaking the aluminum bottlenecks looked like the last worry. . . . But today, "steel is critical" again. Tight items include hot rolled bars, plates, sheets and tubing. . . . Causes of the grow- ing pinch are suddenly expanding requirements of the Services and pro- duction losses expected to reach 14 per cent in the second quarter. . . . Producer troubles are drafted manpower and work stoppages.

POSSIBILITIES: Anything can happen in war, and Washington's production planning has taken this into account. . . . WPB Vice Chairman Charles Wilson let the cat out of the bag, told reconversion-conscious auto builders and workers that when Germany surrenders 35 per cent of U. S. war production will be diverted to civilian manufacture.

MACHINE TOOLS: Long slated for steady cutbacks, the machine tool industry bounced back with increased output in March and April. . . . Big news during the past month was the upward revision of contemplated 1944 production (see page 106) with a rush of Army orders pushing earlier estimates of \$375,000,000 in business up another \$100,000,000. . . . Like every other es- tablished industry, machine tool makers are "postwar conscious." For news of what production engineers will demand in new machine tool designs, read the "PRODUCTION Round-Table" from Los Angeles (see page 67).

LAST-MINUTE NEWS REVIEW OF MASS MANUFACTURING



Behind the TAP

THE FINEST BUNCH OF DISTRIBUTORS IN THE WORLD



Yes, you get more than a fine tap when you specify "Greenfield"—and one of the most important *plus values* you receive is the "on the spot" service of Greenfield Distributors. Your local "Greenfield" Distributor carries a complete stock. He can be at your side in a few minutes. In nearly every industrial center in America you will find

that the leading small tool supplier is a member of the nation-wide "Greenfield" distributing organization, devoted to helping you solve your production problems.

*Yours
For Better
Threading*

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS





International News photo

New machine tool design requirements and the postwar outlook for mass manufacturing in the West were topics of discussion at the second "PRODUCTION Round-Table", held in Los Angeles, May 9. Participants in this forum, one in a nation-wide series sponsored by the Bramson Publishing Company, were, left to right: W. A. Herman, D. W. Gardiner, J. A. Kingston, D. E. Ludden, H. B. Smith, W. La Bouvie, C. Knox, and A. Rosenstein. Each represented large Southern California industries.

MACHINE TOOL DESIGN REQUIREMENTS REVEALED IN WEST COAST MEETING

SOUTHERN CALIFORNIA production leaders are emphatically optimistic with respect to future employment requirements and a high level of industrial activity after the war. Contrary to a general impression existing in other portions of the nation, these men feel that the great influx of workers from the middle west and other states are in California to stay, and that means will be available to keep them employed.

Meeting with staff editors at Los Angeles, the representatives of a cross-section of industrial California specified requirements for a progressive production program in the second of a series of PRODUCTION Round-Table discussions. Relating their problems to the entire West Coast picture, these men expressed a need and belief in the possibility for rapid reconversion of metal-working plants. Speed was judged as necessary to enable employment for the present labor supply, before war-time savings will have run out.

Predominant opinion expressed in-

dicated that the major share of war-expanded facilities will prove useful in postwar production. One executive said that blue-prints were completed for a 50 per cent increase in output from his plant.

Generally, requirements for additional tools, as divided between new equipment and war-built machinery, showed that new machinery and tooling would be needed for high production and precision work, and that such used equipment as that now owned by the Defense Plant Corporation might be used to replace pre-war jobbing shop machines. Some of the group indicated interest in acquiring as much as 40 per cent replacement of pre-war installations with the newer, war-built equipment.

The meeting produced specific requests for improvements in a range of machine and tool designs which included turret lathes, duplicating equipment, press controls, and grinding wheels. Suggestions were coupled with general expressions of satisfaction in the ability of machine tool

builders to meet new problems.

Present at the informal dinner meeting were Walter LaBouvie, Acting Master Mechanic, Kinner Motors, Inc.; Clifford Knox, Plant Engineer, Vultee Field Division, Consolidated Vultee Aircraft Corporation; H. B. Smith, Assistant Superintendent and Factory Engineer, O'Keefe & Merritt Company; John A. Kingston, Factory Manager, Norris Stamping & Mfg. Company; D. E. Ludden, General Supervisor, Tooling Division, and D. W. Gardiner, General Superintendent, Tooling Division, Douglas Aircraft Company, Incorporated; W. A. Herman, Tool Engineer, Byron-Jackson Company; and Allen Rosenstein, Plant Engineer, Utility Fan Corporation.

This group represented progressive manufacturing experience in such varied fields as refrigeration, automotive parts supply, oil field tooling, and aircraft frames and engines. Without exception, they admitted war-born experience in solving manufacturing problems which once had

PRODUCTION ROUND-TABLE

PRODUCTION ROUND-TABLE

been considered almost impossible of solution. They made such general observations as that the decrease of skill in labor had forced them to simplify production equipment.

In the development of advanced manufacturing methods, there seemed reason to believe that quality could be improved in the product without increasing cost. A sidelight on this outlook was presented by W. A. Herman, of Byron-Jackson, who spoke of "planning on better tools for higher production."

When aircraft industry representatives indicated the need for heavier frames to meet the needs for high speed milling, members of the group appealed generally for "more meat" in machine tools. This tied in closely with a comment on the difficulty of preventing transfer of gear marks or chatter on work when machining with carbide cutters. Even the application of fly-wheels did not eliminate the marks, they said.

LESSONS IN TOOLING

H. B. Smith, of O'Keefe & Merritt, pointed to a worthwhile experience with DPC equipment. As pre-war stove manufacturers, his company had watched costs carefully, had not seen its way to frequent investment in new machines.

Introduction of new equipment for war production, though in many cases it was a matter of taking what was available rather than what might have been wanted specifically, enabled production engineers to venture beyond pre-war production limits. They were able to do things they previously had not conceived of doing. They learned more about application of machines, more about what to expect, and more about what to demand from equipment.

Among the outstanding experiences

described by firms engaged in stamping was one about the use of carbide punches and dies, as in notching and slotting laminations.

A general observation, backed by every man present, was that money invested in good tooling pays off. There was no such thing as "cheap" tooling, they agreed. For example, Walter LaBouvie, of Kinner Motors, felt that used DPC equipment would not fit into the picture for production of precision built parts. Allen Rosenstein, of Utility Fan Corporation, saw increased need for heavy presses to turn out the larger stampings which, increasingly, are being specified.

AUTOMATIC ASSEMBLY EQUIPMENT

With regard to metal forming in general, considerable interest was expressed in automatic assembly equipment, incorporating the use of welding, riveting, and furnace brazing. Precision stamping has advanced to the point where these men feel that it can be an important part of mass production, provided that component parts can be readily assembled.

Aircraft production engineers saw a broad future for machine design in their field. Favoring the advantages of stretch forming to produce a variety of contours in sheet, they asked for simplification of operations on the standard machines now on the market. Utopia, as far as they were concerned, would be an automatic sequence of hydraulic actuation in place of the sometimes complicated routine of manual operations.

The advent of larger aircraft has tended to exaggerate some of the problems which did not seem so important in the construction of smaller models. Obviously, these men have begun to think—though independently of their present tooling assignments—in terms of the recently

announced design which will carry 400 passengers. Where present tooling should be adequate for production of present day plane models, some changes may be required to build larger planes.

Working over larger skin surfaces, they feel that lighter portable tools will be required to lower fatigue, particularly on women workers. (Both sides of the question of whether women will remain in the plants are hotly argued.) But more important, in some ways, than these considerations, are those dealing with the actual physical problems imposed by the materials themselves.

Thicker skin surfaces have increased the requirement for drilling equipment which may permit drilling and riveting in combination—not dissimilar in many ways to equipment which now punches and rivets from a single head. Somewhat to the amazement of others present, aircraftmen went so far as to ask for extrusion presses which would produce changing bevels and taper in the heavy channel-sections which big planes will require. Sizes of these sections were compared loosely to those of standard steel rails.

IDEAS ON BENDING MACHINES

These men are accustomed to thinking in such terms as the "impossible takes a little longer." A little closer, to practical realization possibility, was their mutual interest in rolling and bending machines which would alter the bevel on angle sections as well as produce required contour.

Comments on high speed milling did not place the entire burden of improvement on machine frames. Though it was felt that equipment had to be "beefed up" all the way around, some improvement seemed to



ORIGINATED by The Bramson Publishing Company, the PRODUCTION Round-Table is a fact-seeking forum of manufacturing executives conducted by the editors of this magazine.

Designed to reveal current and post-war machine tool design requirements, it serves also as a sounding board for

future trends in industrial skill-requirements, new materials and fabricating techniques visualized in a wide range of mass production industry.

With participants drawn from representative industry of the region in which each Round-Table is conducted, these meetings are revealing fundamental factors which will guide future machine tool purchases. It is believed that the opinions expressed by the outstanding production engineers at these forums will materially assist the government in its surplus machine tool disposal problems, machine tool builders in gaging future market demands, and production men in appraising their own methods and equipment in relation to the trends in metal cutting indicated.

The West Coast Round-Table, held in the Los Angeles Biltmore Hotel, May 9, was the second of a series scheduled dur-

PRODUCTION ROUND-TABLE

be needed in the design of cutters. Present emphasis on reducing the number of teeth is obviously a compromise with the horsepower available in conventional equipment. Numerous present-day improvements in cutter design have proved helpful to a degree, but experience is that they have not proved universally so. In other words, no cure-all has been acclaimed.

In forming metals for other than aircraft parts, a representative producer of precision stampings found that custom-built presses for rugged work were doing a satisfactory job. In addition to the continual need for the best tool room equipment that can be produced (tooling is the greatest asset to the progressive forming department), this manufacturer sought resistance welding equipment, brazing ovens, and even enameling equipment which would permit more economical assembly of stampings.

ENGINEER SUGGESTS DEVICE

Smith, of O'Keefe & Merritt, followed the course of the aircraft engineers in asking for a machine, now non-existent, which would permit more economical production.

Referring to tooling for press work, he asked for, "a hydraulic duplicating machine that will 'finger' a pattern." He didn't feel that the request for equipment to facilitate tooling of dies for complicated draws was out of line in that aircraft plants have made equipment which supplies certain basic requirements. The possibility of the application of the air-gage principle wherein the tracer affected the escape of air from an aperture and thus activated hydraulic cylinders was discounted because of the difficulty which he had found in maintaining steady pressure.

The subject of single purpose ma-

chinery was considered, and to some extent taken for granted as an increasingly important factor. The group welcomed the possibility of greater flexibility through the application of semi-portable heads, pointing to its obvious advantage in production of any varied line of products.

In line with a general interest in simplifying equipment for easier operation, Kingston, of Norris Stamping, pointed to the ever-present need for protecting the equipment itself. The use of electric eye applications and strain gages has proved invaluable in saving damage to dies and presses when the punch is activated though no work has been placed in the press.

With regard to metal removing machines, the group felt that need for prevention of tool breakage through carelessness was present, but that machine tool builders had probably provided for this insofar as they were able. The difficulty in preventing damage was admittedly in varied causes, including the paradoxically frequent cases where overconfidence of the most skilled operators was the source of trouble.

GRINDING WHEEL DEVELOPMENTS

W. A. Herman of the Byron Jackson Company, has made some remarkable experiments in grinding wheel shapes. Cutting a herringbone pattern in 3" wheels, 24" diameter, has boosted production on fine finished work as much as 100 per cent. A plunge cut with this type wheel has also produced a most excellent finish. The operation of the wheel seems to be such that heat is dissipated rapidly, the wheel does not load, and thus does not require as frequent dressing. The suggestion was made that segments of proper shape might be inserted in a standard body.

Another improvement which Her-

man felt would have broad application was a universal flame hardening machine, hydraulically actuated. In oil field tooling, such a machine would be operated for the most part around cylindrical parts.

A requirement which Knox, of Consolidated-Vultee, thought extremely important in the light of the flame hardening idea, concerned the more specialized requirements for heat treating new aluminum alloys. Finer control of heat treating temperatures of the age-hardening alloys is a necessity. Where long "cooking" of material is required at temperatures of 225° to 375° F., temperature variations of 5° plus or minus are detrimental to the work.

"WARM-UPS" AND LUBRICATION

One improvement suggested in machine design, which arose from recent experience with such alloy steels as SAE 4140, concerned elimination of a machine warm-up period which one or two of the men had found necessary. This problem was found in attempting to hold turret lathes to machining to tolerances of .001" or less. Some modification of bearing installations was called for by the men who had experienced this difficulty.

This specific request, concerning high alloy steels, brought a rather surprising second from another member of the group, who found lubrication of machine tools in general somewhat deficient. Most of the machines in this man's plant have rebuilt lubrication systems.

Automatic shell turning machines, particularly those with large spindles required to chuck 6" cases, were most likely to require attention, in that their large bearings had to be held tightly to maintain tolerance. This required installation of a flushing system. THE END

ing the next few months in the nation's important mass-manufacturing centers. Because of current interest in the postwar production possibilities of the far west, this meeting is especially newsworthy. The opinions expressed are not those of a biased news-gatherer, but rather of men actively engaged in normally competitive California industry.

In contrast, the first meeting at Toledo, Ohio, April 21, brought together six executives from mid-west industries ranging from high production automobile work to the precision manufacture of commercial and laboratory scales.

At the first mid-western meeting, Round-Table discussion centered on the possible utilization of excess war-built ma-

chine tools with all industries represented agreeing that such machines can only find a place in postwar industries involved in highly repetitive operations on a product of static design. As regards machine design, the Toledo conferees called for increased output per unit and special equipment engineered for greater flexibility.

The inevitability of product design change visualized by these long-established producers was reflected by a universal demand for special unit type machines possessing design characteristics that would permit easy conversion to various jobs without the rigidity now inherent in much special purpose equipment.

Gaging Systems

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LACK OF UNIFORMITY on gaging policy for gagemaker's tolerance and wear allowance is the chief difficulty facing tool engineers charged with providing these important inspection tools. The principal objective of gaging is to obtain maximum interchangeability, but this demands a suitable system for fits.

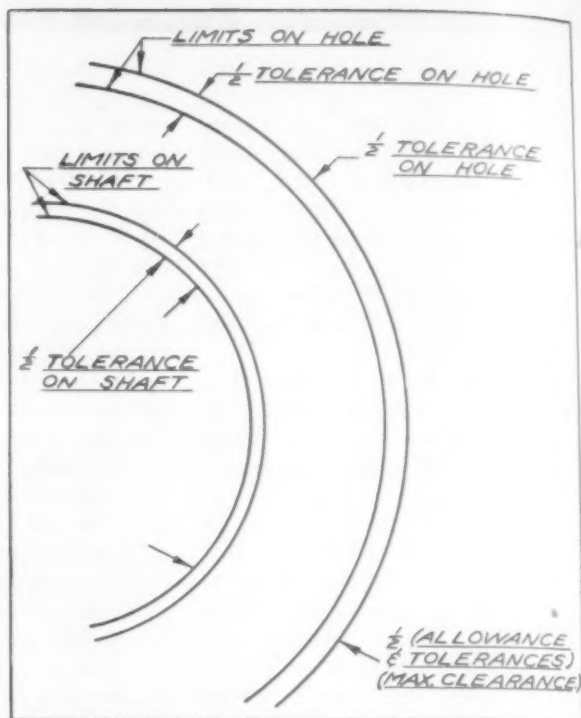
The disagreement in policy among several gaging systems which industry has been forced to use demonstrates a need for uniformity.

A gage is a manufactured article and must be given a manufacturing tolerance. Also, since a gage is subject to wear, the extent of permissible wear must be established.

Gaging policies differ widely in respect to gage manufacturing tolerances and wear allowances. Direction of application of the tolerance is the main point of issue among three systems in common use.

The first system, based on American Tentative Standard B4a-1925, states: "The extreme sizes for all

FIGURE 1.
Illustration shows fundamental gaging specifications: Basic size, allowance, tolerance, and limits.



plain gages shall not exceed the extreme limits of the parts to be gaged." Fixed limit gages demonstrate this principle. Figure 2 shows a hole with the "go" and "no go" gages to check it. The gages must be of such size that the "go" gage will enter the smallest acceptable hole minimum and the "no go" gage will be refused by the maximum permissible hole.

Ideally, gages should be the exact size of the limit that they are intended to check. Practically, a gage maker's tolerance is required and, wherever necessary or possible, an allowance for wear should be provided.

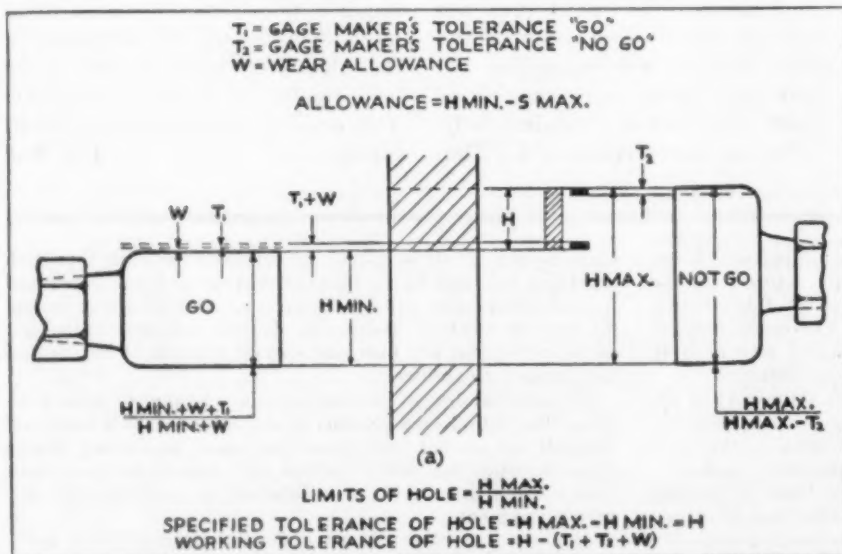
In the case of the plug gage, the tolerance is added to the minimum hole limit and subtracted from the maximum. The "go" gage enters most holes, since it checks simultaneously as many elements as possible. For this reason, a wear allowance (w) is added before the gage maker's tolerance (t) is applied (also in a plus direction). Thus (H being specified hole limit) a new "go" plug gage is held within the limits.

$$\frac{H \min + w + t_1}{H \min + w}$$

Thus the deviations of the gages from their nominal sizes has reduced the specified tolerance of the hole. The maximum to which the reduction may amount is $t_1 + t_2 + w$ and the minimum amount is w .

The same method is applied to the gaging of shafts. All snap or ring gage tolerances and wear allowances are taken within the specified tolerance of the shaft, but the tolerance or allowance is applied in a negative direction on the "go" gage. The "go" gage receives most of the shafts; therefore, the wear allowance is subtracted before the gage maker's tolerance is applied, (also in a negative direction). A gage maker's tolerance only is applied to the "no go" gage, in a positive direction. There is no wear allowance since wear is towards the "go" gage and in the direction of safety. In both plug and snap gages tolerance is applied in the opposite

FIGURE 2. Wear allowance and manufacturing tolerance on fixed limit gages, American Tentative Standard.



direction to the wear.

The same line of reasoning is used with all systems, deviation of gages reducing the actual part tolerance. The main difference is in the direction of gage tolerance.

In most gaging systems, the gage maker's tolerance is related to the component total tolerance. The magnitude of the tolerance affects the cost of the gage as well as its useful function. If the tolerance on the gage is reduced more than necessary, cost rises. If tolerance is too large, the gage will not fulfill its intended function.

TOLERANCE VALUES REQUIRED

A gaging system is incomplete without definite values for permissible gage wear and gage tolerances. In addition, a "marking figure" should be indicated on the gage so that it may be removed from inspection at a predetermined dimension.

When successive inspections are required, it is desirable that working gages be of dimensions inside the limits of those used in succeeding inspections. Schedules of wear allow-

War production has emphasized the need for a uniform gaging standard. This study of three systems points to the best features of each and a possible combination of values to attain maximum interchangeability

ance and tolerance are shown in Figures 3 and 4.

Other factors that must be considered by the designer include the material used in the construction of the gage, the materials being checked, the total quantity of work to be checked, and the frequency with which the gage will be used.

This system satisfies the main requirements of a gaging system; i. e., direction and definite values for permissible wear and gage tolerance, together with a difference in the dimensions of work and inspection gages. The main objection to it is its restriction of specified work tolerance, a factor which is noted increasingly with closer precisions.

Admittedly, such a system assures reasonable interchangeability, but the final objective is *maximum* interchangeability.

COM- PO- NENT	GAGE		
	TOTAL TOLER- ANCE	WEAR ALLOW- ANCE	TOLERANCE GO NO GO
.0005	.0005	.0000	.00005 .00005
.001	.001	.0001	.0001 .00005
.002	.002	.0001	.0001 .0001
.003	.003	.0001	.0002 .0001
.004	.004	.0002	.0002 .0002
.005	.005	.0003	.0002 .0002
.006	.006	.0004	.0002 .0002
.007	.007	.0004	.0003 .0002
.008	.008	.0005	.0003 .0002
.009	.009	.0005	.0004 .0002
.010	.010	.0005	.0005 .0003
& UP			

FIGURE 3.

Wear allowances and gage makers' tolerances; plain plug, ring, and snap inspection gages, American Tentative Standard.

FIGURE 4. Schedule of wear allowances and gage makers' tolerances for work gages, American Tentative Standard.

GAGE TYPE	COMP. TOOL	GO		NO GO		Δ
		WEAR ALLOW. (a)	GAGE TOL.	WEAR ALLOW. (b)	GAGE TOL.	
PLUG, SNAP, AND RING	0.0005	0.00015	0.00005	0.0000	0.00005	0.0001
	0.001	0.0003	0.0001	0.0000	0.00005	0.0002
	0.002	0.0003	0.0001	0.0001	0.0001	0.0002
	0.005	0.0004	0.0002	0.0001	0.0001	0.0003
	0.004	0.0006	0.0002	0.0002	0.0001	0.0004
	0.005	0.0007	0.0002	0.0002	0.0002	0.0005
	0.006	0.0008	0.0002	0.0002	0.0002	0.0006
	0.007	0.0009	0.0002	0.0002	0.0002	0.0007
	0.008	0.0010	0.0002	0.0002	0.0002	0.0008
	0.009	0.0011	0.0003	0.0002	0.0002	0.0009
	0.010	0.0012	0.0004	0.0003	0.0002	0.0010
	0.012	0.0015	0.0005	0.0003	0.0003	0.0012
	0.014	0.0017	0.0006	0.0004	0.0003	0.0014
	0.015	0.0018	0.0007	0.0005	0.0004	0.0015
	0.016	0.0020	0.0008	0.0005	0.0004	0.0016
	0.018	0.0020	0.0009	0.0006	0.0005	0.0016
	0.020	0.0020	0.0010	0.0007	0.0006	0.0016
	0.022	0.0020	0.0010	0.0008	0.0007	0.0016
	0.024	0.0020	0.0010	0.0009	0.0008	0.0016
	0.025	0.0020	0.0010	0.0010	0.0010	0.0016

(a)=insp. gage wear allowance + insp. gage tolerance + work gage wear allowance.
(b)=insp. gage tolerance.

DIMENSIONS

PLUG

GO: Add allow. & apply tol. +
NO GO: Subtract allow. & apply tol. -

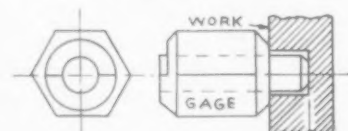
SNAP AND RING

GO: Subtract allow. & apply tol. -
NO GO: Add. allow. & apply tol. +

FLUSH PIN

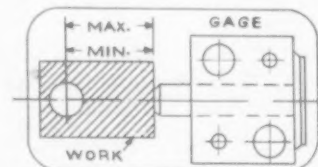
SEE TYPE A SEE TYPE B

A GO : ADD TO MIN.
NO GO: SUBTRACT FROM MAX.



MIN. IS GO .000 + 0.000 MIN.
MAX. IS NO GO .000 - 0.000 MAX.

B GO : SUBTRACT FROM MAX.
NO GO : ADD TO MIN.



MAX. IS GO

MARKINGS: FOR MARKING "GO"

Add Δ to, or subtract Δ from, the component dimensions, as follows:

PLUG: Add.
SNAP (plain & adjustable): Subtract.
RING: Subtract.
FLUSH PIN: If type A, add to min.
If type B, subtract from max.

FOR MARKING "NO GO"

On all gages, use actual size of No Go gage (gage maker's tol. not included).

FIGURE 5.

Gage makers' tolerances adopted by Gage Manufacturers Association.

● As a general rule, gage tolerance is held to approximately 1/10 of the tolerance allowed for the piece being gaged, or 10% of the difference in diameter of a "Go" and a "No Go" gage for that part.

In order to keep from encroaching on the working tolerance of the gage, plug gage members are held to the following accuracies—"Go" members on the plus side of the nominal dimension, and "No Go" members equally divided on the plus and minus side.

Ring gages are held on the minus side unless otherwise specified.

CYLINDRICAL RING GAGE SYMBOLS

X=Precision-lapped to very close tolerances, and are used principally as master and reference gages. They are not used as working gages except when especially close tolerances are required.

Y=Precision-lapped, and are used as working gages and inspection gages of accurately ground parts.

Z=Used when extreme accuracy is not essential, and when the working tolerances are fairly liberal. These gages have

a ground and lapped finish. This is the regular commercial type of ring gage that manufacturers furnish unless the requirements call for greater accuracy.

ZZ=Ground, but not lapped. These ring gages are the most expensive available, and are used when the number of pieces to be gaged is comparatively small, and when tolerances are liberal.

CYLINDRICAL PLUG GAGE SYMBOLS

XX=Precision-lapped to very close tolerances, principally for master gages, master disks, and setting gages.

X=Precision-lapped to close tolerances. These are used for some types of master and inspection gages, and for working gages when the tolerances are especially close, and when the highest grade of precision is required.

Y=Lapped to slightly larger tolerances than the preceding classes, and intended to be used as working gages.

Z=A commercial finish—that is, these gages are ground and polished, but not lapped. They are used as working gages when the tolerances are liberal and the quantities of pieces to be gaged are small.

ABOVE	TO AND INCLUD- ING	MALE GAGES ONLY XX	X	Y	Z	RING GAGES ONLY ZZ
.029—	.825	.00002	.00004	.00007	.00010	.00020
.825—	1.510	.00003	.00006	.00009	.00012	.00024
1.510—	2.510	.00004	.00008	.00012	.00016	.00032
2.510—	4.510	.00005	.00010	.00015	.00020	.00040
4.510—	6.510	.000065	.00013	.00019	.00025	.00050
6.510—	9.010	.00008	.00016	.00024	.00032	.00064
9.010—	12.010	.00010	.00020	.00030	.00040	.00080

The second system represents the practice of some American gage manufacturers. The main difference between this system and the one just discussed is in the disposition of tolerances on the "no go" gages. The tolerance on the "no go" plug extends in two directions from basic size instead of one. The "no go" ring is given a negative rather than a positive tolerance in order to encroach as little as possible on the working tolerance.

The argument for this system is in the product designer's intention that the shop shall work to the full tolerance shown on the part drawing. No definite wear allowance is given, but to afford maximum gage life, the tolerance on the "go" gage is applied in the direction of the "no go" gage.

A "go" plug gage having a tolerance in the direction of the "no go" gage to provide for working tolerances and wear, automatically takes away part of the working tolerances of the hole. A "no go" plug gage

having a tolerance in the direction of the "go" gage takes away more limit. From this, it follows that the minimum "no go" gage should be the same as the maximum limit of the hole. The maximum "no go" plug would necessarily be the maximum limit of the hole plug gage maker's tolerance. Although the argument points to a positive tolerance on the "no go" plug gage, a bilateral tolerance was adapted until the matter might be definitely settled. (See Figure 5).

10% WORK TOLERANCE

With this system, the gage maker's tolerance is related to the component total tolerance as in the first system discussed in one case and to the diameter in another. The tolerance for plug and ring gages as adopted by the Gage Manufacturing Association is shown on Figure 5. As a general rule, it is held to ten per cent of the component total tolerance for work gages, and five per cent for in-

spection gages, unless otherwise specified. This difference between work and inspection gages prevents conflict in the acceptance of parts by a worn work gage that would be rejected by the inspection gage.

The Gage Manufacturer's Association has adopted four classes of tolerances for standard commercial plug and ring gages, which cover most of the conditions necessary for interchangeable manufacture.

Cylindrical ring gages are furnished in four different groups, according to finish and accuracy designated, as Class X, Class Y, Class Z, and Class ZZ. Cylindrical plug gages are made in four classes. The tolerances are the same except that an XX tolerance is added and the ZZ tolerance is eliminated. The four classes of plug gages are designated XX, X, Y and Z.

This system falls short on some of the main requirements of a gaging system, but it does lean toward the practical side in striving to attain

maximum interchangeability.

The third system satisfies the main requirements of a gaging system, as well as attaining maximum interchangeability. It is the system of tolerances for plain limit gages as recommended by the British Standards Institution in their War Emergency Specification B. S. 969: 1941.

The main difference between this system and the first one discussed is that the tolerance zones for inspection gages border on the outside of the specified work tolerance. However, it generally agrees with the disposition of tolerance of the Gage Manufacturer's Association, insuring that no work within prescribed limits will be rejected. Tolerance zones for work gages lie inside the specified part tolerance.

SMALL GAGES EXCEPTED

An exception is made in the case of "no go" work gages for small work tolerances up to 0.0017". In such cases, the tolerance zone for the work gage is either the same as the "no go" inspection gage outside the tolerance zone for the work or it straddles the adjacent work limit.

The object of this exception is to avoid an unduly large encroachment on the work tolerance where this is

a matter of small magnitude.

Total specified work tolerance is reduced to some extent by the work gages, partly to assure that all work which passes work gages will also pass the corresponding inspection gages. The remainder is caused by a provision of wear allowance on the "go" gage.

Gage tolerances relating to the specified component tolerance do not depend on the size of work, presuming that size should be considered when the tolerance is fixed by the product engineer.

The magnitudes of gage tolerances have been made as large as possible, to facilitate gage manufacture. Yet, an unduly large gage tolerance would, in the case of a work gage, unjustifiably reduce the work tolerance, and, in the case of inspection gages, would increase the risk of accepting work outside specified limits. Recommended tolerances are shown in Figures 6 and 7.

When the number of components being manufactured warrants the use of setup gages and work-inspection gages, the new gages are measured and those nearest to the work limits are marked for setup inspection. As "go" gages used on set-up become slightly worn, but still are within the

tolerance zone, they may be transferred to work-inspection. Wear on "go" work-inspection gages may still leave them serviceable as inspection gages.

All work and inspection gages are clearly marked with H and L dimensions which they are intended to control, together with the words "go" and "no go".

The appendix of the British system remarks that gage tolerance is directly related to the work tolerance, and that designers should choose part tolerances as large as consistent with their satisfactory functioning.

CONSIDER AVERAGE FIT

An added remark is to the effect that in specifying tolerances for mating parts, too much attention is often paid to the conditions resulting from assembly of the loosest and tightest possible fits. Such extremes are unlikely to occur, and a much better choice of tolerances is obtained by considering the average condition of fit.

This line of reasoning is shown in ball bearing catalogues, where specified sizes are shown and expected fit indicated for 95 per cent of all cases.

Knowing the designer's attitude towards proposed standards not of

FIGURE 6. Tolerances for work plug gages, British System.

WORK TOLERANCE Difference between high (H) limit and low (L) limit		DISPOSITION OF GAGE TOLERANCE					
ABOVE	UP TO AND INCLUDING	GAGE TOLERANCE	GO		NO GO		
			H LIMIT OF GAGE TOLERANCE FROM L LIMIT OF WORK INCHES	L LIMIT OF GAGE TOLERANCE FROM L LIMIT OF WORK INCHES	H LIMIT OF GAGE TOLERANCE FROM H LIMIT OF WORK INCHES	L LIMIT OF GAGE TOLERANCE FROM H LIMIT OF WORK INCHES	
INCHES	INCHES	INCHES					
0.000 3	0.000 7	0.000 05	+0.000 05	0	+0.000 05	0	
0.000 7	0.001 2	0.000 10	+0.000 1	0	+0.000 05	-0.000 05	
0.001 2	0.001 7	0.000 15	+0.000 15	0	+0.000 05	-0.000 1	
0.001 7	0.002 5	0.000 2	+0.000 2	0	0	-0.000 2	
0.002 5	0.003 5	0.000 3	+0.000 3	0	0	-0.000 3	
0.003 5	0.005	0.000 4	+0.000 5	+0.000 1	0	-0.000 4	
0.005	0.007	0.000 5	+0.000 7	+0.000 2	0	-0.000 5	
0.007	0.009	0.000 6	+0.000 9	+0.000 3	-0.000 1	-0.000 7	
0.009	0.012	0.000 7	+0.001 1	+0.000 4	-0.000 1	-0.000 8	
0.012	0.015	0.000 8	+0.001 3	+0.000 5	-0.000 2	-0.001 0	
0.015	0.020	0.001 0	+0.001 6	+0.000 6	-0.000 2	-0.001 2	
0.020	0.025	0.001 2	+0.001 9	+0.000 7	-0.000 2	-0.001 4	
0.025	0.03	0.001 5	+0.002 3	+0.000 8	-0.000 3	-0.001 8	
0.03	0.04	0.002	+0.002 8	+0.000 8	-0.000 4	-0.002 4	
0.04	0.05	0.003	+0.003 8	+0.000 8	-0.000 4	-0.003 4	
0.05	0.07	0.004	+0.005	+0.001	-0.000 5	-0.004 5	
0.07	0.10	0.005	+0.006	+0.001	-0.000 5	-0.005 5	
0.10	0.15	0.006	+0.008	+0.002	-0.001	-0.007	
0.15	0.20	0.007	+0.010	+0.003	-0.001	-0.008	

FIGURE 7. Tolerances for inspection plug gages, British System

WORK TOLERANCE Difference between high (H) limit and low (L) limit			DISPOSITION OF GAGE TOLERANCE			
ABOVE INCHES	UP TO AND INCLUDING INCHES	GAGE TOLERANCE INCHES	GO		NO GO	
			H LIMIT OF GAGE TOLERANCE FROM L LIMIT OF WORK INCHES	L LIMIT OF GAGE TOLERANCE FROM L LIMIT OF WORK INCHES	H LIMIT OF GAGE TOLERANCE FROM H LIMIT OF WORK INCHES	L LIMIT OF GAGE TOLERANCE FROM H LIMIT OF WORK INCHES
0.000 3	0.000 7	0.000 05	0	-0.000 05	+0.000 05	0
0.000 7	0.001 2	0.000 10	0	-0.000 10	+0.000 10	0
0.001 2	0.001 7	0.000 15	0	-0.000 15	+0.000 15	0
0.001 7	0.002 5	0.000 2	0	-0.000 2	+0.000 2	0
0.002 5	0.003 5	0.000 3	0	-0.000 3	+0.000 3	0
0.003 5	0.005	0.000 4	0	-0.000 4	+0.000 4	0
0.005	0.007	0.000 5	0	-0.000 5	+0.000 5	0
0.007	0.009	0.000 5	0	-0.000 6	+0.000 6	0
0.009	0.012	0.000 7	0	-0.000 7	+0.000 7	0
0.012	0.015	0.000 8	0	-0.000 8	+0.000 8	0
0.015	0.020	0.001 0	0	-0.001 0	+0.001 0	0
0.020	0.025	0.001 2	0	-0.001 2	+0.001 2	0
0.025	0.03	0.001 5	0	-0.001 5	+0.001 5	0
0.03	0.04	0.002	0	-0.002	+0.002	0
0.04	0.05	0.003	0	-0.003	+0.003	0
0.05	0.10	0.005	0	-0.005	+0.005	0
0.10	0.15	0.006	0	-0.006	+0.006	0
0.15	0.20	0.007	0	-0.007	+0.007	0

FIGURE 8.

GAGING SYSTEM

Summary of advantages
of three gaging systems.

Definite Gage Maker's
Tolerance

Definite
Wear Allowance

Intentional Diff. Between
Work & Inspection Gages

Least Encroachment
on Component Tolerance

Maximum Permissible
Gage Tolerance

Consideration for Small
Tolerances Below .0015

AMERICAN
TENTATIVE
STANDARD

GAGE
MANUFACTURER'S
ASSOCIATION

BRITISH
SYSTEM

→			
→			
→			
→			
→			
→			

his own making, it is not the purpose here to try to sell, or condemn, a specific system. However, it is possible to list requirements and compare systems.

To obtain maximum interchangeability, certain requirements must be considered. These may be summarized as:

- a definite gage maker's tolerance
- a definite wear allowance
- an intentional difference between work and inspection gages
- least encroachment on component tolerance. (This embraces direction and magnitude)
- maximum permissible gage tolerance
- consideration for small tolerances below .0015"

(g) direction of tolerance—determined by policy

(h) considerations of material and frequency of use bearing on whether work and inspection gages or inspection gages only.

A summary of how the three systems discussed measure up to the considerations is shown on Figure 8.

The Gage Manufacturer's Association System and the British System are in more or less general agreement on direction of tolerance. The policy adopted by the British Standard of a positive tolerance on the "no go" plug gage should strengthen the argument for its incorporation into the American Gage Manufacturer's System.

The simplicity of table construction of the first system based on the American Tentative Standard may be well combined with the practical policy of the gage manufacturer's Association System and British System in forming a national standard.

The decision as to the direction of the tolerance should be influenced by the recent standard on threads (National Bureau of Standards Handbook H28) where the inspection gage borders on the extreme limits and the work gage is within the extreme limits of the product.

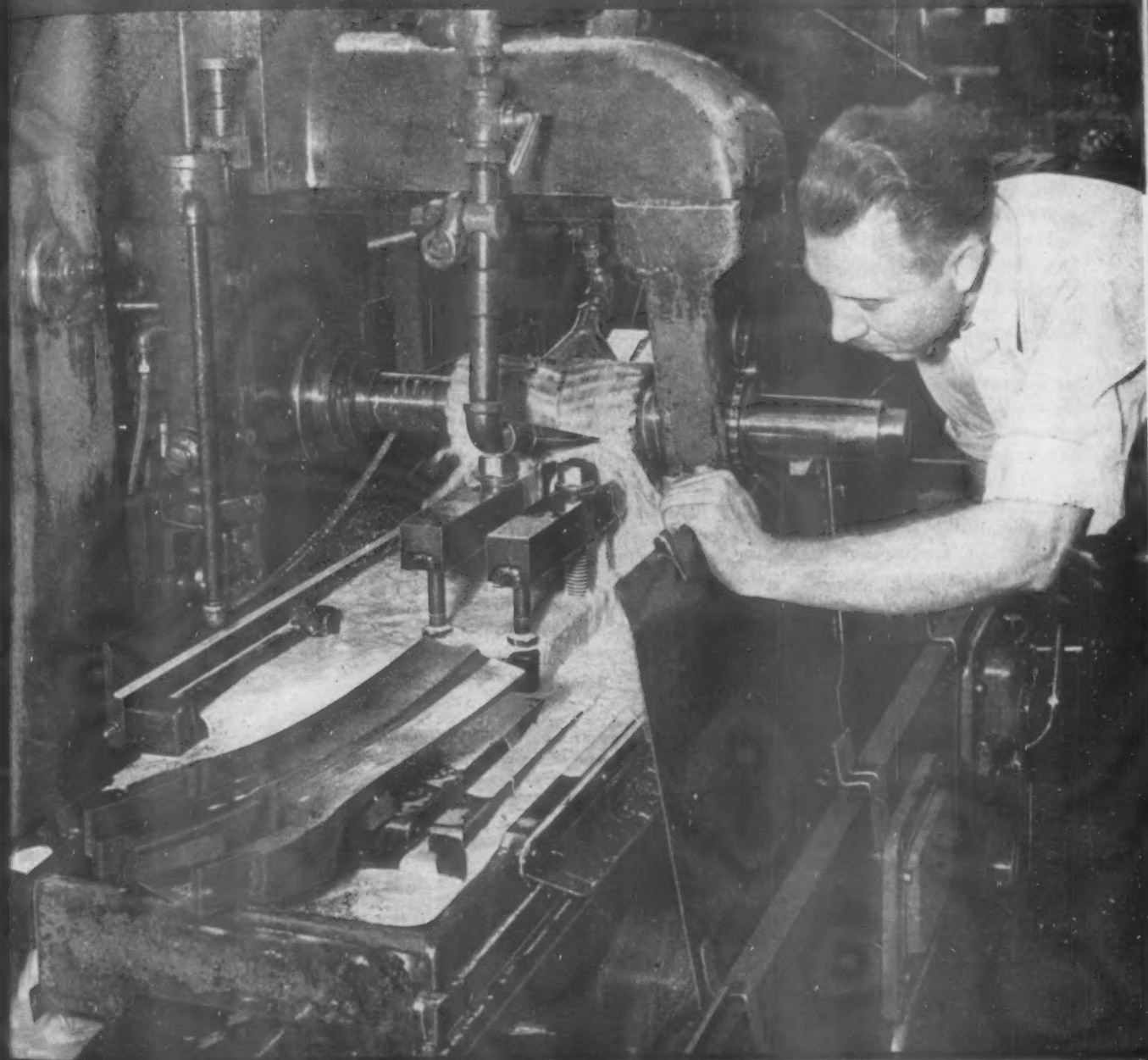
PRE-SET GAGING

To gage the grinding of eight bearing surfaces on aircraft engine crankshafts, the Lycoming Division of The Aviation Corporation utilizes a series of standard gages, each equipped with dial indicators pre-set for a given diameter.

Held in position by a standard grinding gage arm, the pre-set dial indicator registers zero when required diameter is reached. In addition to reducing critical material inventory, this method eliminates the frequency of error occurring when a single gage is reset for each bearing in sequence.

PRODUCTION

MACHINE AND TOOL ENGINEERING



Through the use of rise and fall heads, Plymouth simulates straight milling on curved parts.

MASS-MANUFACTURING FOR INTERCHANGEABILITY

Manufacture of complete anti-aircraft guns, as well as vital sub-assemblies for tanks and aircraft, calls for widely diversified metal cutting methods. Here is the story of an achievement in tooling for a high degree of interchangeability

THE TOOL ENGINEER

Streamlined Production

MASS MANUFACTURING FOR INTERCHANGEABILITY

SPECIAL FEATURE BY THE EDITORS

IN THE COUNTRY'S ENTIRE war production program, there may be no finer demonstration of the possibilities for mass-manufacturing to a high degree of interchangeability than in the tooling achievement of the Plymouth Division of the Chrysler Corporation.

The Plymouth program consists principally of manufacturing vital sub-assemblies for M-4 tanks, the Chance-Vought "Corsair" landing gear, hundreds of Curtiss-Wright "Hell-Diver" and Martin "Marauder" parts, and Bofors 40 mm anti-aircraft gun machining and final assembly. Production-wise, it has meant adapting thinking and practice to the broad range of problems raised by the widely divergent machinability ratings of materials involved, and by the separate gaging policies which are bound to exist between producing a tank and an airplane.

Machining jobs vary from production milling and profiling of radial surfaces in a Bofors gun mechanism, to close tolerance drilling and tapping in the forged alloy steel "Corsair" landing gear, to high-speed contour milling of aluminum extrusions for the "Hell-Diver", to machining from armor plate the 2200-pound front end of the M-4 tank.

Though there is little bomb-sight precision, almost the entire job lies within dimensional tolerance limits of .001"

to .005". With few notable exceptions, these jobs are performed and held to specifications on setups laid out according to the accepted automotive practice of "in-line" production.

For the most part, this article is confined to examining the production achievement as it is illustrated by examples of ingenious tooling. In most instances, there is no mention of a previous method, or of alternate ways of doing a job simply because the actual application practically tells the story.

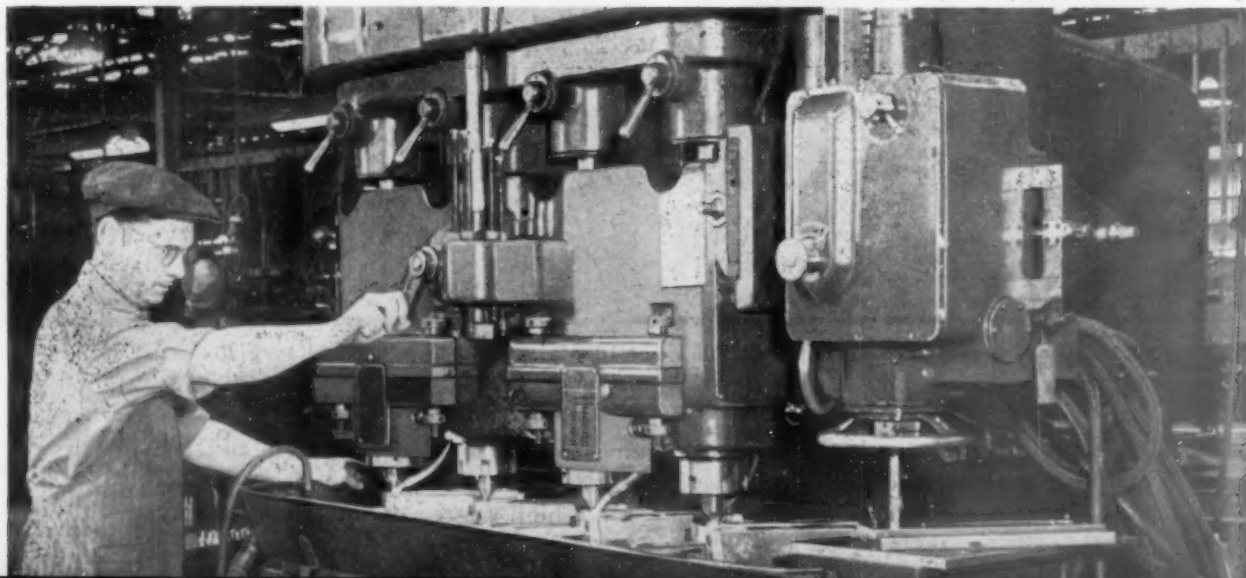
However, certain general considerations are worth noting here, some of which are not discussed, either generally or in detail on following pages. So far as possible, Plymouth has utilized automotive production equipment, sometimes transferring it to new jobs with little change in function. In many cases it was completely rebuilt.

AUTOMATIC PROFILER DUPLICATES FOUR PARTS

Among the new machines, one of the most notable is the four-spindle 360° automatic profiler. Plymouth was the first plant to apply these machines in quantity to regular production. Used on a Bofors gun mechanism, they permit duplication of a single template on four parts simultaneously.

**Plymouth pioneered quantity use of 4-spindle profilers
for mass-production purposes.**

Plymouth Division, Chrysler Corporation, photos and drawings



Indexing fixtures on milling tables have speeded production by permitting preloading as well as by performing more than one operation on the same work setup.

One mass production technique adopted in ordnance manufacture with considerable success has been the burring and polishing of small parts by mechanical tumbling in barrels. Practically all steel parts produced by Plymouth are tumbled, a fine even radius and finish being thus developed at great savings over hand filing, polishing, and other conventional methods. Abrasive materials, including sand, shot, and stones, are suspended in oil or other carrier solutions, and are tumbled with the parts. Careful regulation of the mixture for the various applications makes possible the complete removal of sharp edges, tool marks, and normal machining burrs.

Although this article bears heavily on the improvements and progress made in the machine phase of tool engineering, there have also been notable developments in cutting-tool design, which have resulted in longer tool life. In addition to the application of inserted blades in mild-steel cutter bodies, Plymouth has developed several new ideas in "interlocking" contour cutters.

The use of multiple tooling on lathes, gang cutters on milling setups, and multiple-spindle drilling heads is in keeping with automotive practice. Their application to the precise requirements of present day production tasks resulted in considerable saving in work handling, a most valuable consideration in the light of the amount of equipment and experienced manpower available for the job.

PRELOADING BOOSTS PRODUCTION ON MILLING

Indexing fixtures for milling setups permitted preloading of work, as well as finishing more than one surface in one loading. One of the most common types in use at the Plymouth plant involves machining on one side of the fixture, loading on the other, and turning the fixture 180° in changing the work. Several applications, incorporating the use of gang cutters and index fixtures, have been made on aircraft landing gear parts.

On one job, a "wishbone" section is machined on both ends by this indexing method. The arbor is equipped with gang cutters, a portion of which mill the sides of the "single end" of the work, the remainder being required when the two ends of the open section are milled following indexing.

The story of Plymouth production achievement would not be complete without some description of instances where production has been facilitated, costs lowered, and



economies in labor and machine time established through product redesign. Prior to the organization and setup of production equipment for the Bofors gun job, careful attention was given the specifications for finishing parts where actual function demanded only the machining of one or two bearing or working surfaces. With military authorities' approval, Plymouth eliminated as much as 30 per cent of the machining called for in original drawings on the parts assigned to Plymouth.

One of the most notable engineering changes requested by Plymouth was the substitution of malleable iron casting for steel forgings on one of the parts for a gun assembly. This change reduced the material cost approximately 70 per cent, and saved between 30 and 50 per cent in tool costs. It also released more than 1000 hours of machine time per week for other production.

These savings do not include the time saved in cutter grinding, nor in outside forging capacity. Nor do they point up the saving effected in the greater machinability of cast iron, where cutter speed is raised from 1-1/2" and 2" per minute, to 5" per minute.

In several instances, angles, contours, and planes which were difficult to machine, were redesigned to assist the development of "in-line" production.

PRODUCTION MACHINING AND ASSEMBLY OF GUN MECHANISM

MACHINING AND ASSEMBLY of parts for one particular mechanism on the Bofors 40 mm anti-aircraft machine gun has demanded application of a broad range of machines and cutting tools. Without exception, however, Plymouth production engineers have set up every

job for high-production output, either by means of the special adaptation of heads and feeding mechanisms, or by use of all-purpose machines in conjunction with ingenious fixturing. A constant effort to improve methods has resulted in rebuilding much of the special-purpose machin-

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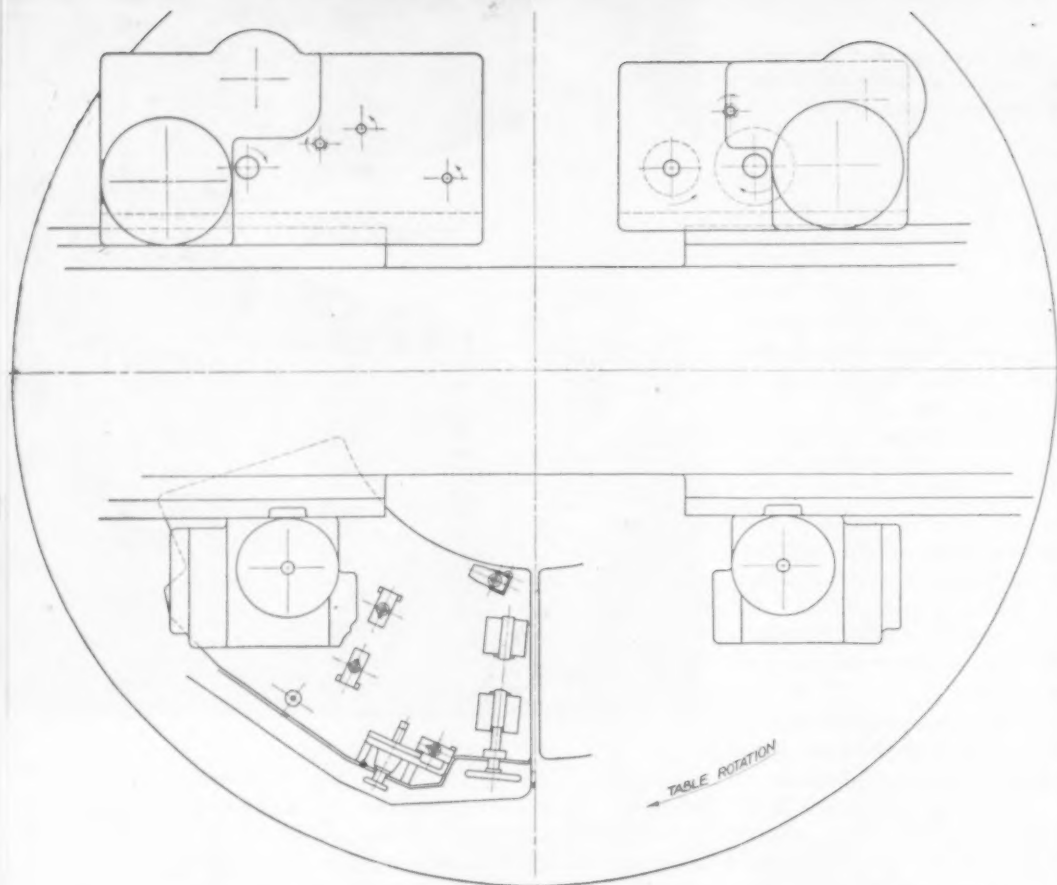


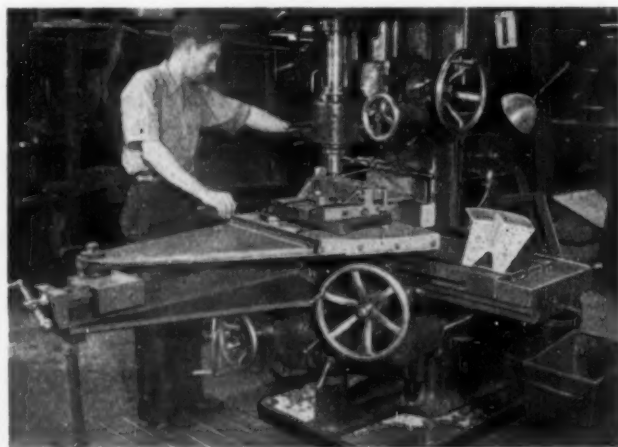
FIGURE 2.

For milling radial surfaces on Bofors gun loading side frame, four heads are mounted above rotary milling table. Drawing shows location of spindle in the head.

ery once devoted to the production of automotive parts.

One of the best examples of adaptation of former automotive equipment is the conversion of a rotary milling machine from facing top and bottom surfaces of cylinder blocks to the milling of radial grooves and adjacent faces on the bronze side frame of the gun mechanism. Twenty-one surfaces are machined in the one loading. In a sense, more actual benefit is realized from the machine today than previously. Where the circular table served former-

Wedge-shaped milling fixture permits cutting various radii according to adjustment between pivot point and table.



ly as a fixture mounting device only, continuously feeding work to the cutters, it is now applied to establish definite radii of required dimensions. It is the equivalent of a boring mill with nine milling-machine spindles in place of single boring tools.

Four heads, two carrying multiple spindles, have been mounted above the table. The multiple-spindle heads power four and three spindles each and, with the single-spindle heads, are spaced to produce the required radii. Each spindle carries either a facing cutter, or an end and side milling cutter. Finished surfaces are held to rigid limits on size, parallelism, or concentricity.

Machining of the parallel or concentric surfaces comprising grooves and adjacent faces on the one side of the mechanism requires both rough and light finishing cuts, so two rotary milling machines have been adapted to the job. Ten parts are continually in process, loading and unloading being performed as the table revolves.

Previous to the milling operations, the parts are rough turned on vertical boring mills, several parts being loaded simultaneously on the table. The purpose of this operation is to remove the rough, uneven casting skin which imposes excessive wear on the milling cutters. An even depth of cut is left for the milling operation, an important consideration in that uniform feed is a condition of multiple-spindle operations, together with constant cutter speed.

Previous to the application of the rotary mills to the radial cutting operation, a fixture which offers broad pos-

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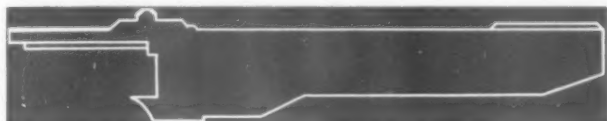
sibilities for short run work or in tool room production was devised to produce pilot models. Used in conjunction with standard milling machines, it permits machining accurately through a variable range of radii.

This fan-shaped fixture consists of a wedge-shaped plate, with the point mounted on a pivot which can be adjusted to extend as much as two or three feet from the milling table. The distance selected relates to the specified radius. Between the pivot and the structure supporting the work at the milling table, a pin slides through a slot to actuate travel of the fixture through the prescribed arc. The large end of the plate is mounted on roller bearings on the table of the machine.

A combination milling and broaching setup has been adapted to machining the face of a large tenon and producing a radius on both edges of a rail adjacent to the tenon surface. These two operations are performed on the outside of the side frames of the mechanism.

A bridge-type, 48" base was applied to this job. A conventional milling head with a single spindle was added to the base. Attached to the head with ordinary brackets is a tool block and holder, so constructed as to permit the broaching tools to ride across the work surface when not cutting. Only one cut is required to produce the radii, and that is performed during the rapid return of the table, following the milling operation, so that no tool marks are left on the work.

FIGURE 3. Combination milling and planer setup machines flat tenon surface at left and produces $3/32$ " radii on top edges of adjacent rail.



To produce the specified $3/32$ " radii, tools are mounted in two rows, three to each row, and are stepped to permit complete rough and finish stock removal in one pass.

Several ingenious tooling applications have been instituted to perform a variety of operations on certain arc-shaped right- and left-hand steel pawl holders and rods which are vital to operation of the 40 mm. Bofors gun.

Operations consist of grooving and turning operations on parallel flats and concentric surfaces, and profiling slots and contours which do not lend themselves to continuous turning operations. For drilling holes which coincide with the radii of the part, rocking-type drill jigs have been developed.

All turning and grooving operations on these radial parts producing surfaces of uniform dimensions throughout, are performed on 74" vertical boring mills. Recognizing the similarly sized arcs as segments of circles of 33" to 34" radius, Plymouth tool engineers devised a common-sense procedure by performing these operations on large rolled-steel rings, of proper diameter, which could be cut into segments of specified size following turning and grooving on the boring mills.

One difficulty which had to be faced on this type of operation was that of controlling the size of the segments in relation to the rolled and welded ring. When the operation was first attempted, the ring segments tended to spring open during cutting because of stress relief. This was partially overcome by predetermining the amount of spring and machining to smaller diameters. However, a better solution was found in control of the rolling and welding operation. Rolling to the required diameter with a bar slightly longer than the required perimeter caused the ends of the bar to overlap.

Sawing the bar so that ends of the circle met without being forced together or apart prevented imposition of initial strains. Following welding of the ends, a normalizing operation further insured strain relief. The only precaution now required in machining is that of sawing the circle into segments in such a manner that the small scrap section includes the weld.

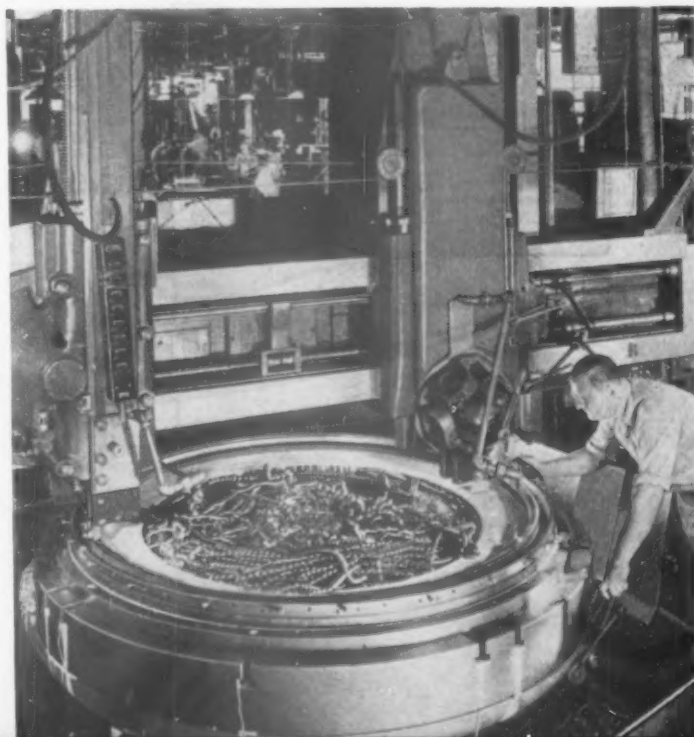
BORING MILLS PLAY VERSATILE ROLE

Operations on the boring mill to produce the parts for the assembly, range from simple establishment of correct radii by means of facing and turning operations to combined grooving, turning, and facing operations. Tool turrets, seen in the illustration below, permit continuous machining without changing tools or moving the work until finished.

Supported on rollers, the finish-machined steel rings are fed to a band saw for cutting into segments of specified length.

Certain of these radial pieces must be finished on multi-

Vertical boring mills with 74" tables are used to machine steel rings — facing, turning, and grooving. Rings are cut into segments which serve as channeled parts for shell-loading assembly.



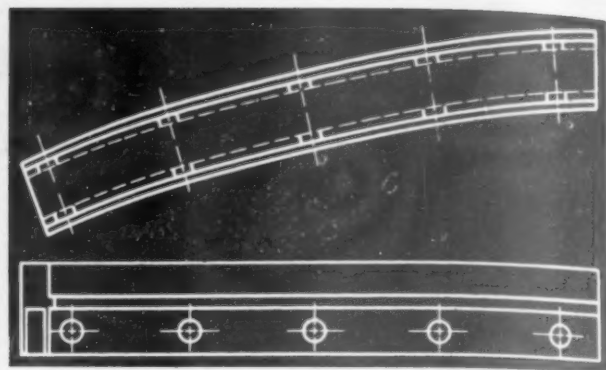
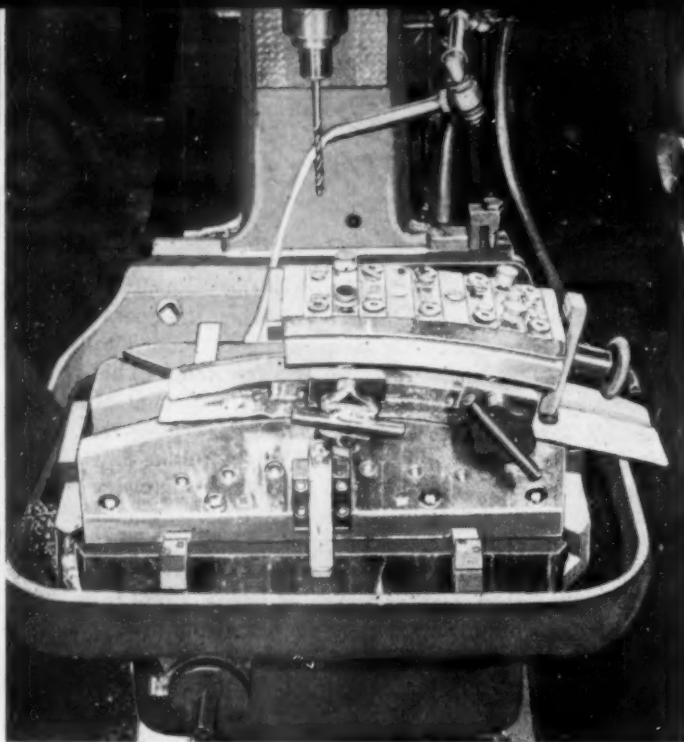


FIGURE 6.

Pin holes are drilled on radii of curved segment by means of drill jigs, so built that concave bottom surface of upper section slides over convex top surface of base.

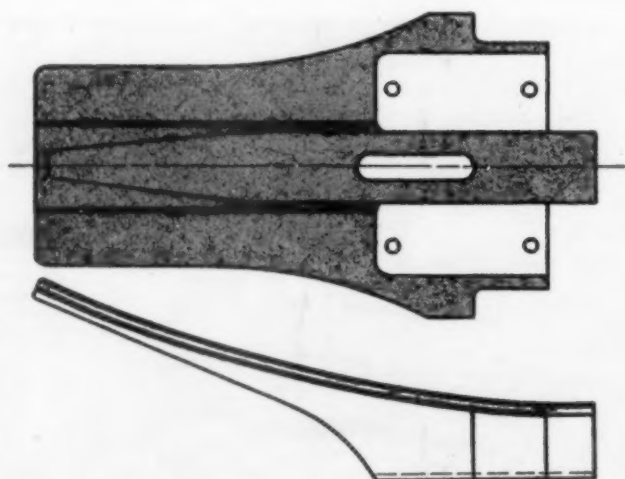
(Left): For drilling holes on the radii of curved segment, drill jig which slides over convex base is used.

ple-spindle profilers. Where a slot concentric with the arc of the piece extends nearly the entire length of the part, most of the stock is removed in a preparatory operation employing multiple-spindle index drilling machines. Four-spindle semi-automatic profilers, operating from a single template and cam follower, finish the work with a minimum input of man and machine hours for this type of equipment.

The operation of these profilers is such that head and table motion combine to produce the required contours within the horizontal plane. The head moves in and out and the table traverses. In producing curves or angles, both head and table must move simultaneously. An im-

FIGURE 7.

Rise and fall head on milling machine, actuated by cam and follower, produces curved surface.



portant consideration is that the follower and tool must have correlated diameters. Wear or diminishing size of the tool must be simulated in the follower to preserve the necessary relationship.

Pawl holders consist of a completely channeled part, with evenly spaced square notches in the channel walls between pin holes. Notches are produced by milling across the channel. Two parts are machined simultaneously on a fixture which permits loading one end while parts are machined on the other end. The fixture can be swiveled 180° upon finishing to position the preloaded end for machining.

Pin holes drilled in line through opposing wall segments coincide with the radius of the arc of the part. A jig which slides through an arc concentric with that of the part is employed in conjunction with a single-spindle drill press to produce these holes. Construction of the jig is such that following drilling of the first hole, in accordance with a stop related to the end of the part, the following holes can be positioned by use of a pin through the last finished hole and a locating hole in the jig. The jig is built in two parts and the concave surface of the upper part slides over a convex lower surface.

The spade-shaped rear shell guide is machined from malleable iron. An examination of the equipment used to produce this part serves to illustrate contour-milling methods which have been used extensively on other parts. Straight milling is simulated by the use of rise and fall heads, controlled by the action of a cam and follower. In this instance, the cam is laid out parallel to the horizontal table traverse.

A variation on this operation, which Plymouth tool engineers set up for a part on another product, consists of a ring cam which encircles a rotary milling-machine table. Rise and fall of the head, as controlled by the cam, produces a specified contour around the edge of a cylindrical wall.

The bronze base of one mechanism requires several in-

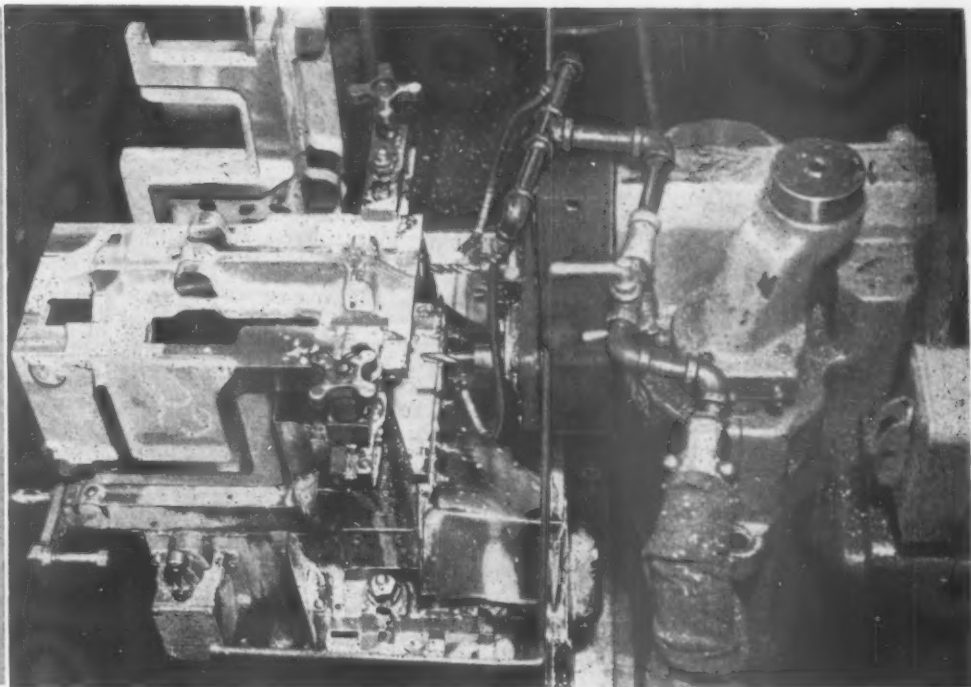
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Special machine permitted machining slots in walls of drilled bosses.

Spiral cutters are powered by stationary head.

Table feeds on traverse, and indexes toward head at end of each cut.



tricate machining operations. For the most part, however, these are accomplished conventionally. First operations on the box-like part consist of establishing locating surfaces and drilling locating holes. Surfaces machined in the first operation are on two levels. Again, the use of a cam follower to actuate a rise-and-fall milling head is required.

In the second operation, automotive equipment was rebuilt for a 3-way multiple-spindle drilling operation. A vertical drill press with a rotary table was fitted with a two-spindle vertical head. Two horizontal spindles are mounted on the floor, 90° from each other and 45° from the centerline through the rotary table and drill press column. Complete hydraulic feed permits preloading parts on the table. Three fixture stations permit machining of two parts and loading or unloading of the third.

One of the tough jobs on the base, which was solved by acquisition of a special machine, consists of producing .354" slots in bosses at the front end of the firing mechanism base. The bosses are semi-cylindrical, and are provided with holes concentric with their outer surface, leav-

ing a .118" minimum wall. Slots extending 1½" from the end of the bosses and from I. D. to O. D., are machined parallel to the axis of the holes.

The first method attempted on this job consisted of drilling and milling the slot. Not only was it difficult to hold the drill to the work, but in milling, the depth of cutter required proved impractical.

The problem was solved through use of a special machine, equipped with two spindles and automatic table traverse and index. Feed in a traverse direction past the cutters, and the index toward the cutters, in increments of 1/16", is automatic at the end of each completed traverse of the table in either direction. Spindles are so spaced that the operation begins with one cutter in the hole, ready to cut toward the outer diameter and the near dies of the base. The other cutter is positioned against the O. D. of the boss, ready to cut toward the hole.

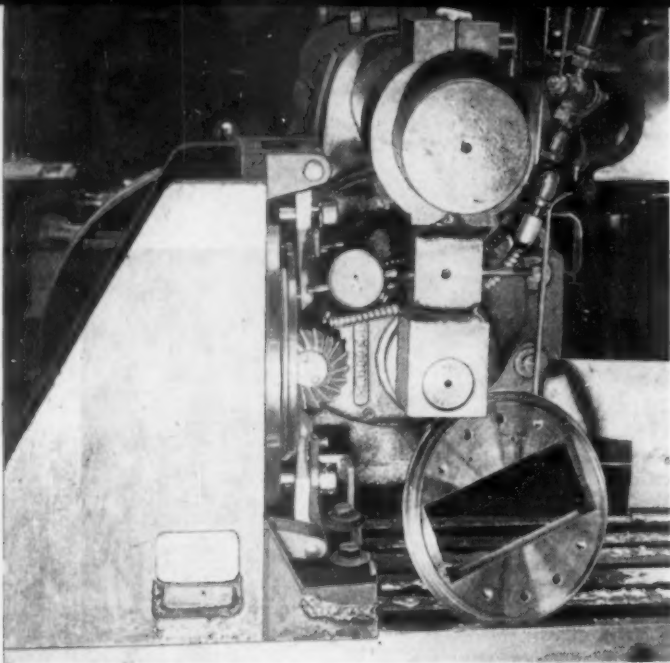
Two machines are used—one for rough work and one for finish. A .325" diameter right-hand spiral cutter, taking a right-hand cut, performs the roughing operation. A left-hand spiral cutter takes a right-hand finishing cut.

TOOLING FOR MACHINING ARMOR PLATE TANK PARTS

MACHINING THE FRONT END of the M-4 tank required careful consideration of the extreme toughness of the material (armor plate), the size and awkward shape of the part, and a matter of handling a 2200-pound part.

As in machining the side frames for the Bofors gun mechanism, a rotary mill was applied to machining a surface within a large arc, using the action of the rotary table

to establish the correct radii. In this instance, the machine columns and cross rail were removed and the milling heads were mounted on the table. Feed is obtained by moving the heads through the arc generated by table rotation rather than by moving the work. The heavy pieces are mounted on fixtures arranged around the sides of the machine, with their weight borne by relatively low-



sub-bases anchored in the floor.

The surfaces being machined consist of the wall and base of that portion or segment of the turret-ring seat included in the front section. With the base of the seat in normal horizontal position, the remainder of the front end section extends at about 135° from the horizontal plane. This shape lends itself to projecting the surface to be machined under the milling heads and at the same time permits the bottom edge of the part to rest on the floor, with fixture support on the angular underside.

Table travel of one revolution produces four finished parts in that each of the two pairs of single-spindle heads operates simultaneously on workpieces which are mounted diametrically opposite at the edge of the rotary table. Of the two spindles operating on each part, one powers a facing cutter to machine the base of the seat, and the other machines the concave side section, employing a side-cutting form mill.

Because of the continuous revolution of the heads and table, it was necessary to provide collector rings above the table to supply power. Coolant is supplied by gravity feed from a revolving doughnut-shaped pan, also mounted above the table.

Compensation for material differences and other machining factors subject to change is obtained by the installation of a Reeves variable-speed motor in connection with the table drive. This equipment is set in a pit adjacent to the machine. Normal feed, with cutter speed at 40 rpm, is approximately $1\frac{1}{2}$ " per minute. For a quick pullout or jump-feed, a clutch has been provided which throws off the Reeves unit and hooks into a direct-drive motor which otherwise is constantly idling. Non-productive activity, such as clearing heads for loading or unloading, and changing cutters, is thus cut to a minimum.

Another example of the use of automotive equipment in fabricating M-4 tank parts is shown in the application of a radial drill in conjunction with two hydraulically op-

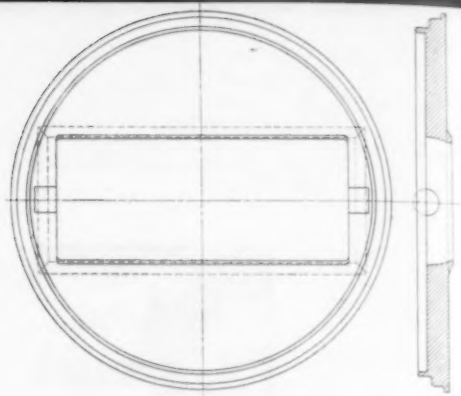


FIGURE 9.

Inside surfaces on tough plate are machined by extension on milling spindle. Double spindle extension is used to finish machine holes on each end of rectangular slot.

Offset spindle on milling machine permits inside cutting operation on tough steel plate. Table feeds back and forth against spindle.

erated multiple-spindle drill heads. The radial drill, having a 6' arm and 19" column, provides vertical-spindle action over a wide area, serving as an all-purpose machine on a specific job. The multiple-spindle heads, on horizontal ways, offer the full value of special equipment performing within a localized area.

Several inside-milling operations, requiring the use of milling-spindle offset extensions, are performed on a tough cast-steel plate. The part is round, having a diameter of approximately 9", with a centered rectangular hole, measuring roughly 7" x 3". Ends of the hole are finished square, but sides are formed to a radius of $1\frac{1}{2}$ ", the axis coinciding with that of the longitudinal centerline of the rectangle. Also having this centerline for an axis are $\frac{1}{2}$ " holes extending $\frac{1}{2}$ " into the plate from the ends of the rectangle.

SPINDLE OFFSETS USED IN HARD-TO-REACH SPOTS

Offset extensions from the milling spindle are required to machine these holes and inside faces because of lack of spindle clearance with conventional equipment. These simple accessories were designed and built by Plymouth tool designers and engineers. Actually they are small gear casings which are secured to the head and which contain a gear train driven directly from the spindle. In this instance the short center-driven spindle is offset so as to be parallel to the axis of the horizontal milling-machine spindle.

In machining the holes, the table feeds in and out against two end mills which are mounted on opposite ends of the extension spindle. The part is held upright in a fixture. Stops on the milling table register the depth of cut against dial indicators secured to the machine frame.

Following a milling cut with a form tool around the inside walls of the rectangular hole, another offset spindle is used to clear up the radii left in the corners. Conventional 3" cutters are fed against the ends of the hole.

Streamlined Production

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MACHINING ON "IN-LINE" PRODUCTION OF AIRCRAFT PARTS

FABRICATION OF AIRCRAFT wing-frame parts and complete landing-gear assemblies has been put on an "in-line" production basis to a remarkable degree. Breaking down the operations and construction of work-holding fixtures to permit automotive procedure has been a difficult task, however. The complexity of angles and contours within integral parts has imposed problems which strain toolroom ingenuity. But, through experience in machining these parts, equipment and fixtures have been developed to meet high-production schedules.

To reach inaccessible surfaces for spot-facing operations, Plymouth engineers have designed special offset drill heads. They are of simple, welded fabrication and employ gear casings with gear trains powering tools at short distances offset from the drill-press spindles.

Inverted drill presses for back spot-facing have been applied to enable the operator to see the work better on various operations. Inversion of standard burring heads has provided high-speed chamfering machines for aluminum parts.

To improve handling of long aluminum extrusions on drilling operations, the handling of cumbersome drill fixtures has been eliminated. Instead, the fixtures are clamped on steel tables so that the entire working area is within the range of three small radial drills.

One of the most impressive savings which Plymouth engineers have effected, however, is in the use of cam patches in conjunction with contour milling of long aluminum extrusions. Conventional practice in operating big spar-milling machines is to use solid, or one-piece, cams which control the rise and fall of the hydraulically actuated head and generate changes in contour of surfaces.

Machining difficulties caused by slight variance in tool grinding, material, temperature, and the multitude of changing factors which result from employment of inex-

perienced help, have been responsible for slight variations in dimensions of the contour produced. Slight as these variations have been, they have necessitated frequent changes in the contour of the cam. Considerable input of man and machine hours was required in producing the long cams, and even where adjustment might not affect the entire cam, the full-sized piece had to be removed and carried to the toolroom for any machining operations.

The obvious difficulties involved in any change on the cam were ingeniously overcome by the development of cam patches. These small adjustable sections can be taken off the cam itself, either for adjustment or replacement, without disturbing more than the short section actually involved. Correction and adjustment are greatly speeded, in that cam cutting operations are reduced to a consideration of a short segment, rather than a continuation of cutting an entirely new cam contour whenever change was required.

CAM PATCHES PROVIDE QUICK ADJUSTMENT

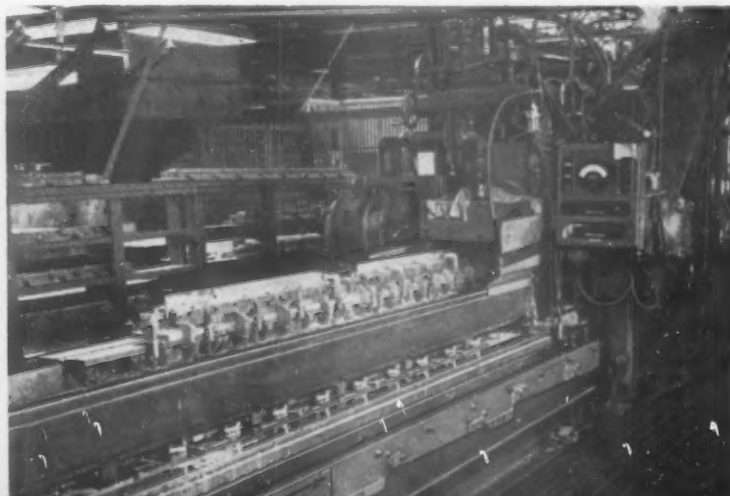
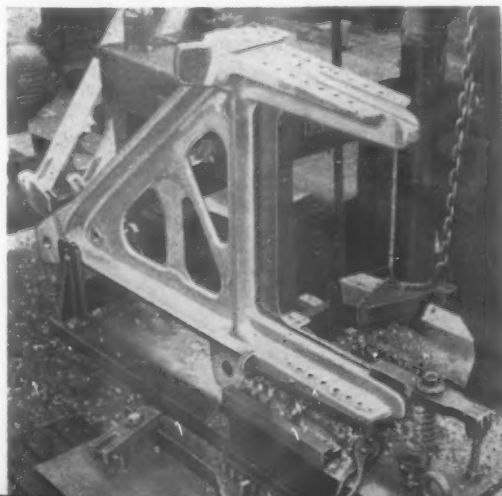
Experience developed with this equipment has been such that the shop has not had to avail itself too often of this maintenance short-cut, but the idea is still a potential time-saver for any future adjustment that may be required because of design changes or variations in the factors controlling tolerance. Cam patches are bolted quickly and easily to the basic cam form.

The spar-milling machines operate at high speed, table feed for deep cuts averaging about 85" per minute. A variable-speed motor, operating from a direct-current generator set, slows cutter feed at the beginning of a cut, thus allowing the spindle-carrier head to follow the cam, and then increases the feed instantaneously to take advantage of aluminum's machinability.

One of the most difficult location problems in machin-

Offset drill spindles have permitted spot facing in inaccessible places on forged aluminum.

Impressive savings were made in fabrication of cams for high speed contour milling operation by use of cam patches which are segments of long cam bolted to machine frame.



Streamlined Production

ing forgings for the Curtiss wing arose in connection with drilling, boring, and tapping large holes in the landing-gear truss. The truss has a long projecting arm with two large holes on the same axis, one in the base, the other in the arm. The design of the part is such that in clamping the work in a fixture, and in applying machining pressure, care must be taken to prevent the part from springing or distorting in any way. Because of the length of the arm, and because of the thin web which supports it against springing at the junction, slight pressure will exert sufficient leverage to cause misalignment.

All precaution for a successful alignment lies in the design of the holding fixture. The part is set upright beneath a vertical spindle and, while loosely held, dial indicators are brought to bear from two sides. After correct alignment is established in the free state, indicators are set at zero and clamps are applied so as to support the work fully. As the clamps are tightened down, the indicators are studied closely to prevent an excess of pressure application in any direction.

Drilling and boring operations are then performed with conventional tools. Tapping, however, has required the design of a special tool. Previous use of a threaded head nut and lead bar proved unsatisfactory, mostly because three taps were required to produce an exceedingly close tolerance. The tool that was designed to do the job eliminated two operations and the need for lead nut and bar.

TOOL ESTABLISHES OWN LEAD AND CLEARANCE

It incorporates a spiral point of two to $2\frac{1}{2}$ threads in addition to the chamfered section of one to $1\frac{1}{2}$ threads. The tool, in a sense, establishes its own lead, and directs the chips from the rough-cut operation downward so that sufficient clearance remains in what might be considered the finishing section of the tap.

Some idea of the complexity of operations performed on the A-frame, an aluminum forging which is part of the wing and landing gear supporting structure, can be gained from consideration of a single gaging fixture which is used to check 17 dimensions from numerous compound angles. Slide and feeler-type gages are used individually and in combination to check surface dimensions, and plug

gages are used in hole inspection.

Production of landing-gear parts is performed on a variety of equipment, and in every instance possible is performed in keeping with high-production practice.

An example of what one high-production machine can do is shown in the application of a thread mill which replaced a temporary machining setup that included four separate pieces of machinery. One of the main handicaps to the installation of this equipment was obtaining a change in specifications to permit use of a thread mill rather than a thread grinder.

The part is a short cylinder, with an O. D. of approximately 4", threaded externally. A hole through the cylinder is shaped in cross-section like an eclipse with truncated ends. Ears rise from the walls of the part. The thread is modified with a slight radius on the crest.

Specifications call for removal of the imperfect starting and finishing threads.

Following external grinding to obtain specified O. D., use of a thread grinder permitted producing the basic thread and the radius at the root. The imperfect threads were removed by means of a milling machine with a planetary head. A buffing operation was required to produce the radius on the crest.

SINGLE-THREAD MILLING REDUCES MAINTENANCE

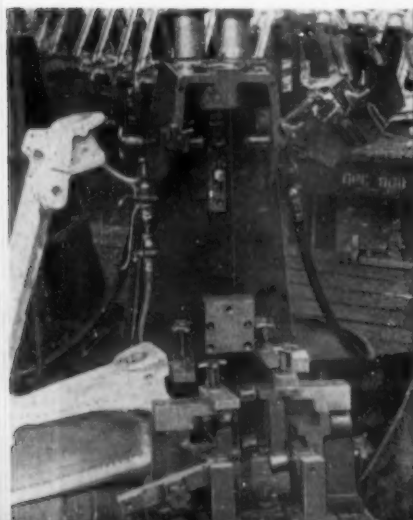
The single-thread milling operation proved satisfactory in meeting dimensional requirements, eliminated entirely four handling operations, released four valuable machines for other work, and reduced by four to one the maintenance of extra tools and grinding wheels.

Preliminary operations on this part consist of broaching the irregularly shaped hole, form-milling the ears, and contour milling a radius from one ear to the other.

The broaching operation resulted in the introduction of a heat-treating procedure before machining to raise the hardness of the part and thus strangely enough, to increase its machinability. The material as received for machining had a Rockwell of three to seven—so soft that material tears were a frequent occurrence. Heat-treating to improve machinability resulted in raising hardness to Rockwell 30C.

Following broaching, the part is hardened to between 39 and 44 Rockwell C, at which point a short sizing broach is drawn through the hole. The hole is developed with a series of five broaches, the tool form progressing from round to the specified shape.

THE END



Wing truss presents difficult drilling and tapping operation because of ease with which part can be sprung from normal shape in bolting in fixture.

Dial indicators are set on part while free, and watched during clamping operation to check against strains due to misalignment.

Broaching soft pivot, part of landing-gear assembly, was improved by hardening soft steel part.



Precision Corrugation Dies

JAMES WALKER

and

CARL C. TAYLOR

SOUTHERN AIRCRAFT CORPORATION

CONSTRUCTION of a set of corrugation dies for 24 ST aluminum alloy, .040" thick, which will hold a 1-1/2" center distance between two individual corrugations 48" apart, within plus or minus .020", is a tough order for any tool and die department. Holding the height of the individual corrugation to within plus or minus .015" further complicates the problem.

Production engineers at Southern Aircraft Corporation "cracked this nut" with the setup shown in Figure 1. However, they found that the actual difficulties encountered in solving the problem were not fully realized until consideration had been given conventional methods, such as those shown in figures 2 and 3, and a few experiments had been made.

Figure 2 shows a standard press brake die design in the open and closed positions. Even though, for most applications, this design is satisfactory, a little study will show why it cannot be applied to the job discussed. No matter how accurately the spring-back of the hard aluminum alloy is figured, or how closely a die is worked out from experimentation, any slight variation in the setting of the press stroke or even the change in temper of the same sheet of metal at one point or another, will cause a variation of center distance from one corrugation to another.

ACCUMULATED ERROR

A variation of as little as .002" per corrugation will accumulate to .60" in 30 corrugations, and the most optimistic workman cannot hope to hold even this tolerance. A re-strike die, to correct variations outside the necessary close tolerance, is impractical, especially on hard springy 24 ST aluminum alloy.

The geared, roller-type corrugation forming tool shown in Figure 3 does not offer the possibilities of the one shown in Figure 2. In working out this problem at Southern Aircraft, it was given little consideration. Engineers decided that each

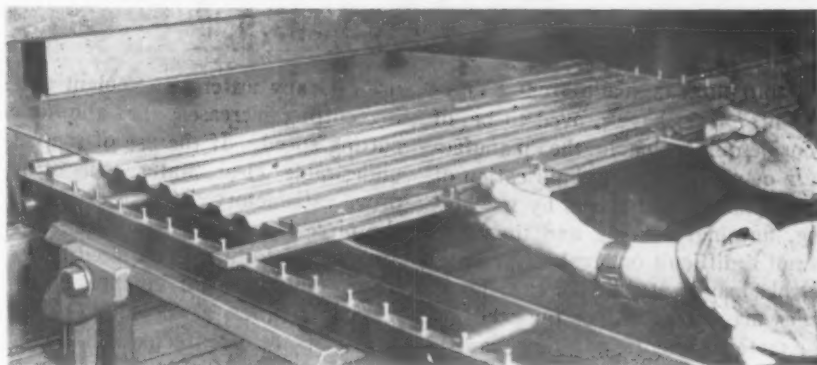


FIGURE 1.

Gage bar is held against stop pin, locating sheet accurately for forming each corrugation. Only accurate form for individual corrugation is built into die.

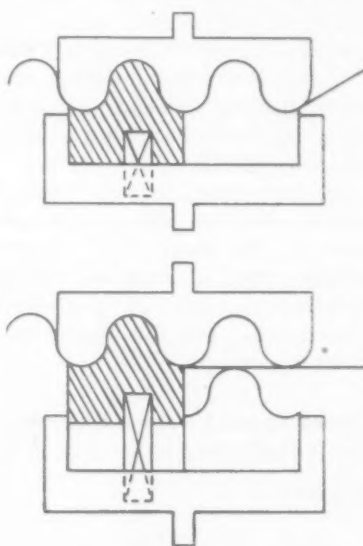


FIGURE 2.

Standard press brake die for corrugating sheet, in open and closed position.

FIGURE 3.

Geared, roller-type corrugation forming tool offers no possibilities for control of forming to close limits.

Southern Aircraft photo and drawings



corrugation must be gaged from an accurately located stop to avoid the accumulated error which resulted from the use of conventional setups. If 30 full corrugations were needed 1-1/2" apart, and use were made of a gage pin at each end of the strip, 60 separate and accurately located stops

would be required for the operation.

Figure 1 illustrates the solution to the problem, showing the die setup in the press brake action. In operation, the gage bar, carrying the handles for the operator to pull, is attached to the end of the strip with cone-tipped thumb screws which bite into the end of the strip outside the trim line. This bar, with the sheet of metal attached, is passed between the punch and die, and is brought to rest on the two long gage bars extending horizontally and at right angles from each end of the die.

ACTION OF THE BAR

The operator pulls the bar against the first two gage pins and forms the first corrugation. A die of this type pulls on the sheet equally from each side. The result is that when the punch is at the bottom of its stroke, the gage bar stands away from the first two gage pins exactly one-half the length of the "take-up" required to form the corrugation.

Next, the bar is lifted over the first two pins and pulled against the next two. Another corrugation is formed with the gage bar again being pulled away from the second set of gage pins exactly the same amount as resulted from forming the first corrugation. This procedure is followed for each corrugation until the required number is reached.

Fabrication of thousands of accurately formed corrugated panels on this set of press brake dies has imposed no difficulty in holding to the allowed tolerances. Strips of indefinite length can be produced.

MACHINING AND FORMING

"VINYLLITE" SHEET

RIGID SHEETS made from "Vinylite" resin have proved to be of considerable value in the manufacture of many articles. Fabrication of these plastic rigid sheets by machining, forming, bonding and finishing, is not a difficult or involved process. Blanks may be stamped or sawed out, holes may be drilled or punched, or the material may be milled or planed.

The principal factor to be kept in mind when designing tools for machining is that the sheets are thermoplastic and, for this reason, soften if heat is developed too rapidly during cutting. (Obviously, this characteristic is highly beneficial to forming). The rate of heat development depends on such factors as tool design, tool sharpness and cutting speeds and feeds. In general, the smoothest cut edge (which implies a satisfactorily low heat-development rate) is secured when the cutting tool has a generous clearance.

Production runs should be set up only after an experimental trial. Recommended machining conditions call for the highest cutting speed consistent with the maximum allowable rate of heat development. The

use of soapy water as a coolant during cutting increases the allowable cutting speed. If the use of soap is undesirable, clear water will often prove satisfactory. If the design of the piece is such that an excessive amount of cleaning is required to remove a liquid coolant, compressed air may be used as a coolant. The air stream should be directed at the cutting edges of the tool in order to clear the chips away rapidly.

COOLANT AND MASKING PAPER

Generally, the chip from the sheet stock is slightly plastic, and it may be inclined to curl itself around drills or fill the clearances on milling cutters. Sufficient coolant or compressed air should be applied to eliminate this condition.

Masking paper, backed with a pressure-sensitive adhesive, or attached to the sheet with pressure sensitive tape, is advantageous in protecting the surface of thick sheets from scratches and dirt during machining operations.

● **Stamping and Shearing:** Rigid sheet stock in thicknesses up to $\frac{1}{8}$ " can be

sheared readily if it is supported by clamps placed as close to the cut as possible. A standard guillotine or pivoter's knife, such as is used for paper cutting, has proved satisfactory. With stock thicknesses over $\frac{1}{32}$ ", it is often necessary to slow down the rate of travel of the knife, and, under certain conditions, it may be desirable to warm either the knife or the sheet stock, or both up to 50-55° C. For thicknesses up to $\frac{1}{32}$ ", steel ruler dies, such as those used for cutting paper, are satisfactory.

Rigid sheets can also be stamped or punched at room temperatures at speeds of from 10 to 100 pieces per minute, depending upon the thickness of the stock and the perfection of the edge desired. Dies should be designed to hold the stock as near as possible to the cut.

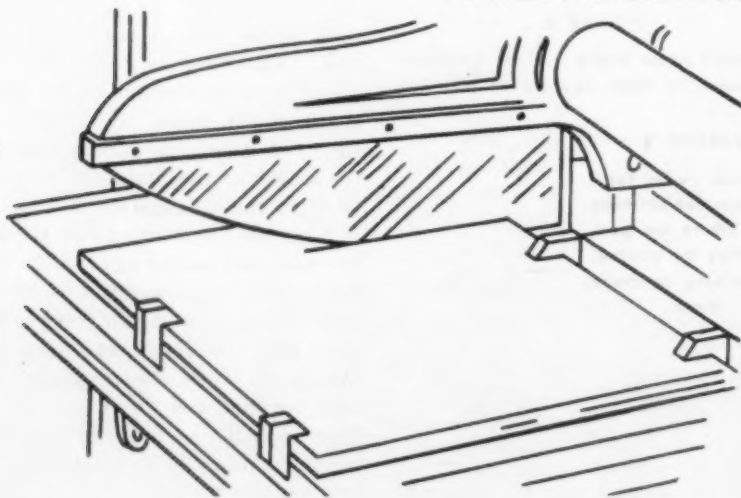
It is desirable also that the cutting edge of the shearing or stamping die have the double-shear action of a chevron knife in order to compensate for the tendency of a single-edge shear to move laterally. If edge cracking occurs during stamping, it can generally be prevented by slightly warming the stock, or die, or by reducing the speed of cutting.

● **Sawing:** Satisfactory sawing of "Vinylite" rigid sheets, like other machining operations, is dependent on the prevention of local overheating and consequent softening of the resin. Because of this, an underwater saw is most satisfactory. This equipment should be fitted with hardened steel blades. The surface speed recommended is 3500 to 4000 feet per minute (1200 rpm for a 12" saw) and the saw should carry 10 to 14 teeth per inch. The teeth should have no set. An average speed of saw travel through the stock of approximately 3 to 4 inches per minute is recommended. In some cases it is possible to use speeds up to 12" per minute.

For smaller production, and where slower cutting speeds are permissible, the plastic rigid sheet stock can be sawed dry on hand or circular saws such as are commonly used in woodworking. It is imperative to use fine-tooth saws with no set. The

Shearing plastic sheet.

Carbide and Carbon Chemicals drawings



Fabrication of thermoplastic rigid sheets made from one of the resin types imposes unusual problems in tool design and press operation

special band saws available for cutting other plastics will work.

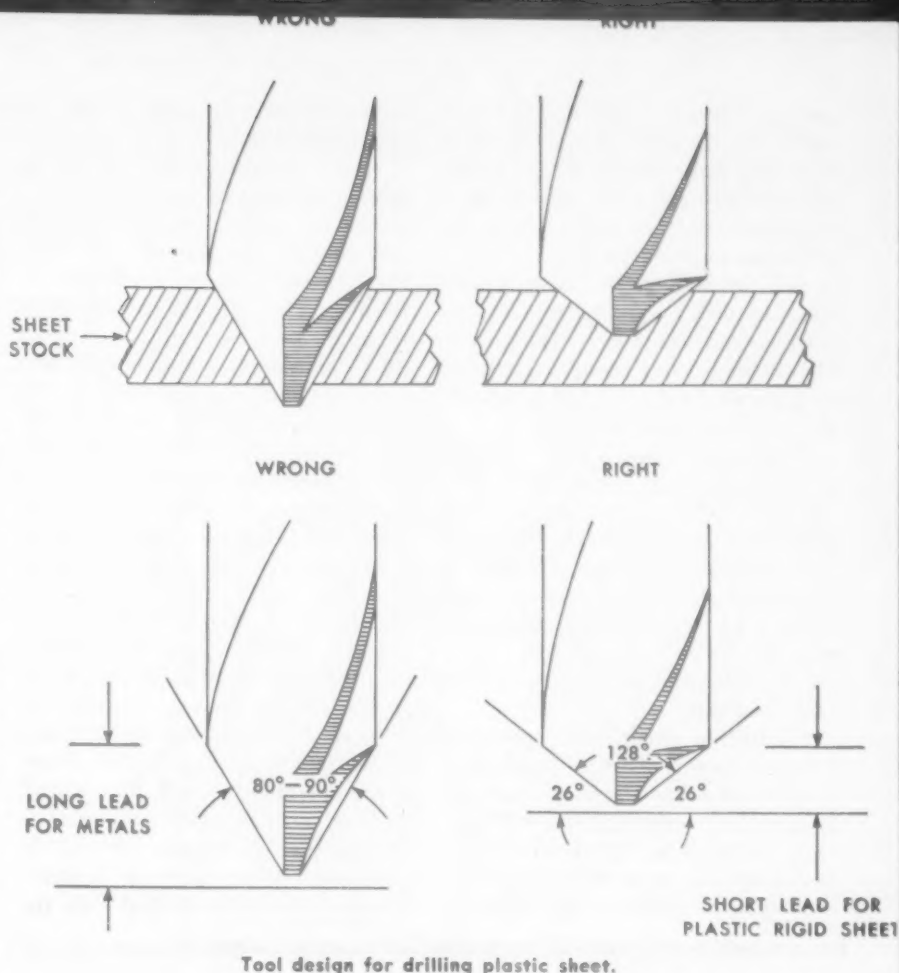
● **Grinding and Sanding:** "Vinylite" rigid sheet can be ground on abrasive wheels similar to those used for metal-working. Wheels having a fine abrasive grain size should be used, preferably with an excess of water as a coolant, especially where appreciable stock is to be removed.

Grinding speeds can be as high as 70 linear feet per minute. Better edge finish is achieved with lower speeds and lighter cuts. For the best surface finish a speed of approximately 48 feet per minute with a cut between .006" and .008" is most desirable, although it is possible to make cuts up to .030" in one operation. The recommended practice for accuracy and good surface finish is to take two cuts, one roughing and one finishing. The roughing cut can be approximately .020" in depth, and the finishing cut approximately .006" deep. Under these conditions, tolerances of plus or minus .001" can be maintained consistently.

The plastic sheet stock can be readily sanded by using either individual abrasive sheets or continuous belts. The use of water as a coolant is highly desirable, since it minimizes loading of the paper or cloth.

● **Turning, Facing and Boring:** Simple turning, facing, boring and chasing operations can be performed satisfactorily with most ordinary metal-cutting tools, provided that the front and side clearances of the tool are increased by about 50 per cent over the clearances used to machine steel. The added clearances reduce the rate of heat formation and produce good surface finishes and free-flowing chips. An increase in rake angle, made by hollow grinding the top cutting face, offers some advantages in directing the chip away from the work. However the accompanying reduction of cutting angle results in a greater tool wear. Surface speeds of between 250 and 300 feet per minute permit depth of cut as high as $\frac{1}{4}$ " and rates of feed up to 12" per minute. Higher speeds and feeds can be used with lighter cuts.

Cutting-off tools should also be ground with increased front and side clearances, and, in using them, the surface speed should be reduced to approximately one-half that used



Tool design for drilling plastic sheet.

when turning sheets. Slower speeds tend to roughen the cut surface, whereas faster speeds may cause overheating of the material.

● **Milling:** Standard cutters can be used for milling rigid sheet stock, but higher speeds are feasible if extra clearances are ground on the cutter blades. It is desirable, and may be necessary, to use an air blast to insure proper chip removal from the milling cutter. Wherever possible, it is recommended that spiral milling cutters be used and that the number of teeth in the cutter head be such that at least two of them are in contact with the work at all times.

Plain cutters are to be avoided because of overheating caused by side friction. The rate of heat transfer through the rigid sheet is so slow that cooling the sheet during cutting on a cool metal plate may be relatively ineffective. It is considered better practice to cool the tool which causes the generation of heat at the cutting edge. Directing a high velocity jet of air through a small orifice at the cutting point should dissipate the heat as it is generated, and remove the chips quickly.

In designing fixtures for milling, it is essential that the fixture grips the work in a manner that will not cause distortion. Since plastics are generally less rigid than metals and, hence, more easily distorted, the stock should be well backed up during the milling operation and should be positioned so that the pressure of the cutter is against the backing.

When possible, cutters should be operated so that the chips are discharged from the leading edge of the cutter in contact with the work. If a cutter is used in this manner, the machine must be in good mechanical condition. Considerably less friction is developed if the cutter takes the heavy part of the chip first, as in climb milling.

● **Planing:** Rigid sheet stock can be planed readily with a slow stroke and a side feed. The depth of cut should not exceed $\frac{1}{4}$ ". The tool should be ground with approximately 50 per cent greater front and side clearances than would normally be used when machining steel.

● **Drilling:** "Vinylite" plastic sheet can be drilled in much the same man-

ner as other materials. Standard drills and the usual feeds are used. For deep holes, (holes whose depths exceed twice the drill diameter, it is recommended that drills having extra large flutes be used.

For best results, it is recommended that the drill be ground so as to reduce its end resistance. The area of the cutting surface should be reduced to approximately one-third of normal to reduce the heat generated.

High-speed steel drills having polished flutes are generally recommended. The use of soapy or clear water as a coolant will also facilitate the drilling operation. Where a liquid coolant is objectionable, a high velocity jet of compressed air, directed at the drill tip, is useful in removing the chips and cooling the work to reduce burring.

For drilling small holes, speeds of 4,000 to 6,000 rpm are recommended. It is desirable that the feed be as high as possible in order that the drill may be in the stock for the shortest practical length of time. The shorter the drilling time, the less is the tendency

for the bit to raise burrs around the edge of the hole.

If the vertical movement of the drill is operated by a cam, the cam should be so designed as to give the following general actions: (1) move the drill to the work as rapidly as possible; (2) move the drill tip slowly, as it starts to work, for about .010", or until it is through the surface; (3) speed up the feed to the conclusion of the full vertical displacement; (4) drill two to five revolutions at the bottom of the hole; (5) withdraw the drill as rapidly as possible. When the hole is being drilled properly, the chip will emerge in a tight spiral similar to that produced while drilling mild steel.

In the design of gigs for drilling, close fitting drill bushings should be avoided. Their use may increase the friction on the drill and the tendency of the chips to plug up the drill flutes. If the operation is such that a drill bushing is absolutely essential, a floating leaf or templet should be employed. When using a templet, the hole should be spotted with the

templet in place, using the drill corresponding to the final hole size, then the templet should be removed and the hole completed. Pilot holes should be avoided, except when the hole is to be reamed or counterbored.

● **Forming:** In fabricating three-dimensional articles from "Vinylite" plastic rigid sheet, advantage is taken of the thermoplastic nature of the material. When heated, the sheet becomes soft and pliable and can then be readily shaped to the desired form by a number of methods including embossing, drawing, swaging, cupping, blowing, and rolling and bending.

In all of these operations, the control of temperature is important. Above its initial softening point, the flow properties of plastic rigid sheet stock change rapidly with temperature. Too high temperature may cause heat marks, while too low a forming temperature will produce articles which are brittle and subject to breakage due to high internal stresses. Therefore, a careful reproduction of processing conditions from one piece to the next is important.

● **Drawing, Swaging and Cupping:** Vinyl chloride-acetate resin sheets can be drawn, swaged, or cupped satisfactorily by either the "wet" or "dry" method. The distinction between wet and dry-working concerns the medium in which the stock is preheated prior to its insertion in the forming die. Ordinarily, the die mold is not heated. Swaging, in general, permits much deeper draws than can be realized by simple embossing methods.

In the dry swaging process, several methods of heating can be used. The sheet, cut to the desired shape, may be heated under the infra-red lamps, on a hot platen, or in a hot air oven. When a hot platen is used, the platen surface is generally padded with a layer of insulation in order to prevent local over-heating. In all cases the surface on which the sheet lies should be soft and clean. Since the warm sheet mars very easily, it should only be handled with clean cotton gloves.

When the sheet stock reaches a uniform temperature—in the neighborhood of 185 to 250° F., depending upon its thickness—it is quickly inserted into the cold swaging mold.

PHYSICAL PROPERTIES OF VINYLITE RIGID SHEETS

"VINYLITE" plastic rigid sheets are a product of the Carbide and Carbon Chemicals Corporation. Made from vinyl chloride-acetate resins, they are produced in a range of thicknesses from .010" to .250", and in a variety of colors and surface finishes. The ease of forming this thermoplastic material further multiplies the variety of finished products that can be made from it, including navigating, calculating and drafting instruments, nameplates, dials and lenses.

During the process of manufacture, the resin compound is sheeted on a calendar and emerges as a strong, stiff sheet, somewhat dull in surface finish. The unpolished sheet, with calendar finish, is usable in many applications without further processing. Often the sheet is polished between smooth metal plates in a multiple-platen press.

● Inasmuch as the resin used in making the sheets is colorless, the sheets can be produced as clear, transparent materials. Color may be added when mixing the ingredients.

"Vinylite" rigid sheets may be formed or machined easily in accordance with established procedures. The rigid sheet is strong, stiff, and permanent in size and form; it is one of the toughest

of all plastics. It requires no "curing", it will not warp, and aging has no effect whatever on its composition or characteristics. This dimensional stability has been of particular value in the manufacture of calculating instruments.

The properties of the material are uniform in all thicknesses. Tensile strength varies from 8000 lb. in. ⁻² to as high as 10,000 lb. in. ⁻², depending upon the type of sheet. The material is stiffer than most thermoplastics for a given cross-section.

● The rigid sheets possess a low moisture absorption characteristic, the absorption of .15 per cent upon immersion for 24 hours at 77° F being a maximum figure. Sheets are unaffected by most chemicals, including alcohols, gasoline, kerosene, and animal, vegetable and mineral oils.

The heat distortion temperature of the sheets will range from a minimum of 135°F to 155°F. At the other end of the temperature scale, the strength of the sheets is maintained even at sub-zero temperatures.

In the fabrication of these sheets into various products, precautions must be taken to prevent excessive heat build-up which might exceed the softening temperature of the sheet metal being processed.

Right: Stamping preheated sheet.

The mold is then closed and subjected to pressure. The material is not allowed to chill appreciably before it has been forced into conformity with the mold surface, but, after the mold is closed, it can be cooled with a stream of cold water or air, or allowed to cool by itself.

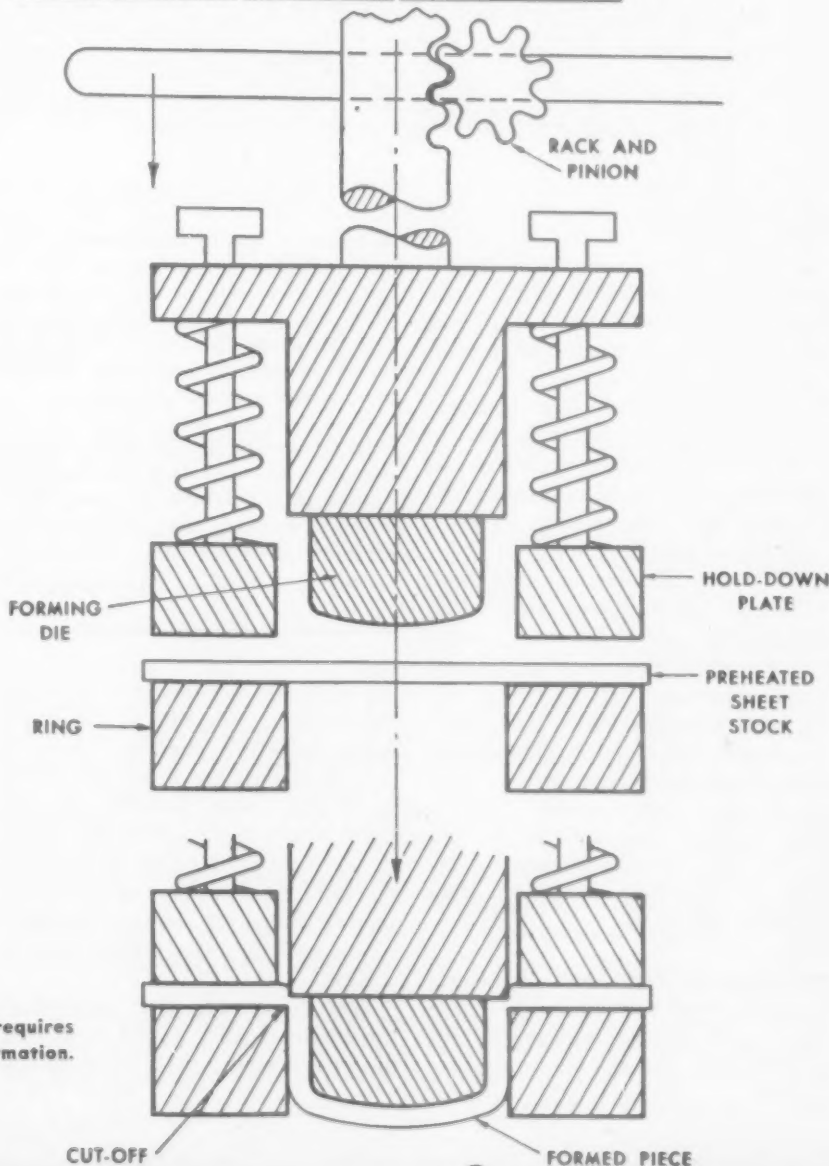
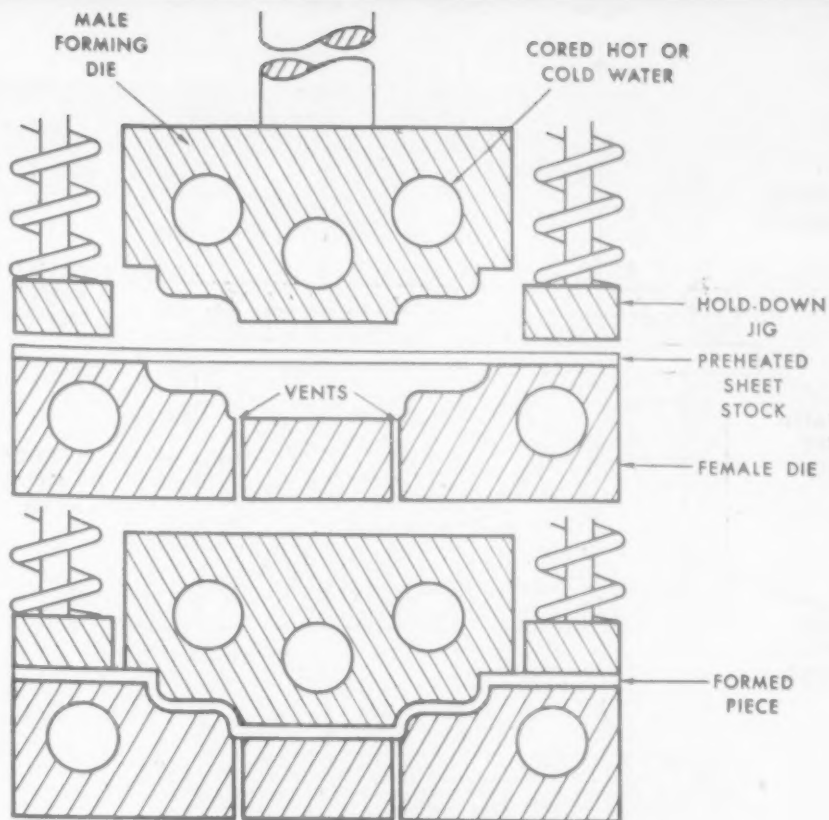
In wet swaging, the sheet is supported on a clamp of the proper design. The entire assembly is immersed in hot water or oil at a temperature of 180 to 212° F. After thorough heating, the assembly is withdrawn. In withdrawal, care should be taken that the shallow ladle-like container, defined by the upper clamp member and the sheet, carries hot water to the swaging mold. The clamp and sheet assembly fit into the open mold which is then closed rapidly in the same manner as for dry swaging.

An improved surface finish is obtained on rigid sheet articles, produced by wet swaging if mild, white soap flakes are added to the heating water. In addition, the female part of the die should be swabbed with a soap solution before each cycle. The soap serves as a lubricant, but also promotes uniform wetting of the resin sheet and prevents the formation of a rough or "pimpled" surface attributable to individual drops of water which might have been entrapped between the resin sheet and the mold surface.

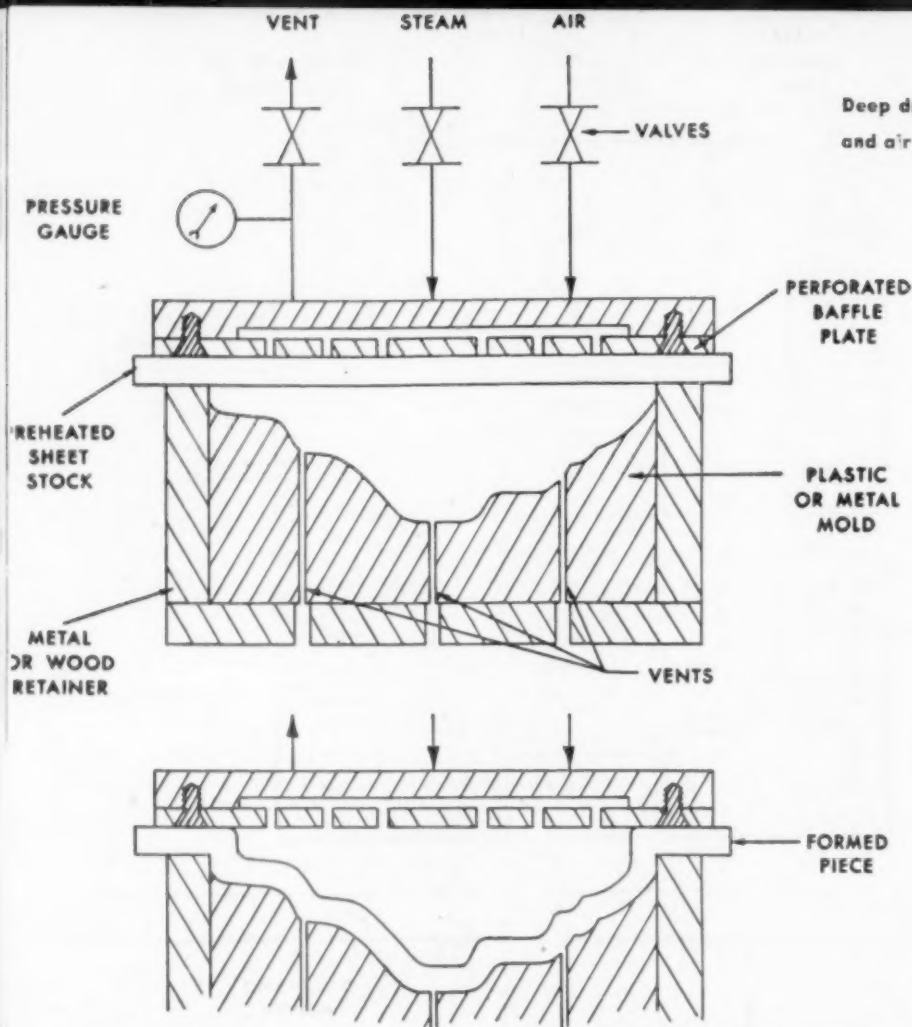
In drawing the sheet stock, the extent of the draw, shape of the drawn article, and thickness of the original sheet determine the forming die clearances. In addition to the usual male and female dies, many successful deep drawing operations are made with a ring and male die, or a female die and air or steam pressure as the forming medium.

• **Rolling and Bending:** Sheet stock may also be formed by a simple bending or shaping operation. Mandrels of almost any desired cross-section or shape may be used. For best results the sheet should be warmed to a temperature of between 165 and 195° F. before rolling it on to the mandrel surface.

A portable hot air blower, similar to a hair dryer, with a special nozzle is



Right: Cupping, like stamping, requires blank-holder close to site of formation.



Deep drawing can be performed with female die and air or steam pressure as the forming method.

plication to the sheet. The rate of application of pressure should be slow enough to cause the area of the sheet in contact with the hot plate to flow freely. The pressure should not, however, be increased to a value which might cause distortion of the outline of the sheet itself.

Throughout the embossing operation, the underside of the sheet should be maintained approximately at room temperature. As soon as the embossing plate has been embedded in the resin sheet (for a $\frac{1}{4}$ " depth, approximately $\frac{3}{4}$ to 1 minute under pressure is sufficient) the upper plate is cooled and the embossed sheet is stripped from the plate.

For shallow embossing, the engraved plate can be applied to the sheet either hot or cold, whichever is convenient. The rate of application of pressure can also be varied between wide limits without causing any undesirable distortion or tendency of the finished sheet to warp.

When suitably pigmented, thin plastic rigid sheets, cold embossed in shallow designs, produce interesting and unusual effects. Male and female dies are used and the sheet is passed between the plates and pressure is applied. In this case the sheet is formed while cold, and strains are set up which result in a whitening effect in the design. Embossed lettering produced by this method stands out clearly.

Cementing and sealing, laminating, and other finishing processes require careful study with regard, generally, to particular applications. The very properties which make "Vinylite" resins valuable industrially, such as chemical inertness, toughness, and insolubility, have made it difficult to bond these resins to themselves and to other materials. This sharply limits the number of materials which may serve as a base for an adhesive. However solvents and laminating thinners have been evolved for rendering surfaces soft enough so they will weld together.

However, beyond machining and forming, this phase of fabrication is a study in itself, demanding thorough understanding of the care and precautions demanded of the various operations.

THE END

often advantageous in warming sheet stock preparatory to bending. Too low a temperature may result in poor retention of the desired shape, while too high a temperature may cause distortion of the stock during handling incident to forming it on the mandrel. Excessively high temperatures will produce shrinkage due to strain release. After the sheet has been formed properly on the mandrel, it should be cooled to room temperature while held in place.

It should be remembered that, consistent with sound engineering practice for most materials, sharp notches and bends must be avoided on all rigid sheet articles which may be subject to breakage. Like all types of plastic sheets and similar homogeneous materials, the plastic rigid sheets are "notch sensitive" and, for this reason, notches and bends should incorporate the largest possible radius of curvature consistent with other design details.

● **Embossing:** Rigid sheet can be embossed by methods similar to those used for embossing cellulose nitrate sheets. The higher impact resist-

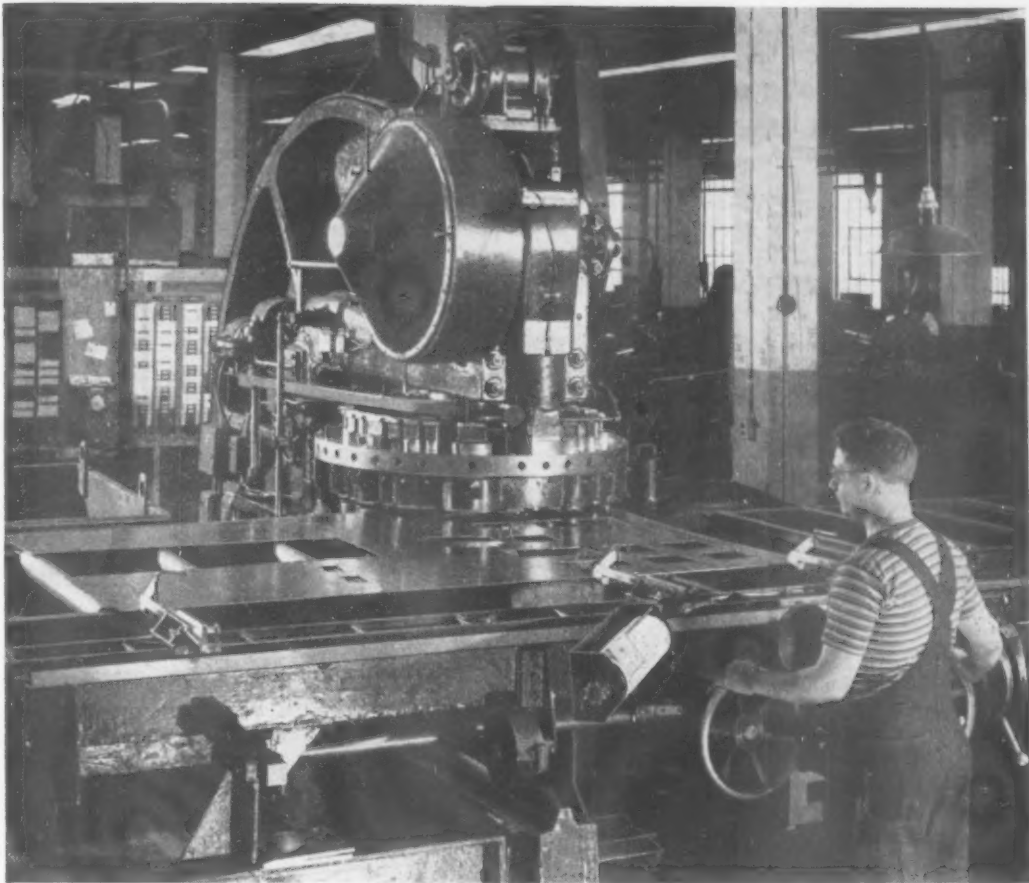
● Growth of plastic fabrication through war production has made consideration of this subject a must for many production men. The postwar role these materials may play in mass production makes study of their characteristics important to many more men engaged in production.

In October, 1943, The Tool Engineer magazine presented facts on machining another plastic, Tenite. Approved fabricating methods for other plastics will be presented in early issues.

—THE EDITORS

ing grades of sheet are most suited to this process. To emboss the sheet, a hot (284°F) engraved plate is pressed against the sheet and chilled while still under pressure, or the sheet is passed through warm (140° to 160°F) embossing rolls. Embossing rolls should be used only for shallow embossing. Embossing plates can be used for either deep or shallow designs.

When producing deep embossing, the engraved plate should be heated to approximately 284°F before ap-



Allis-Chalmers photos

Operating at 80-tons pressure, this Weidemann indexing punch press has been tooled by Allis-Chalmers production men to perform complete work layout on large sheets automatically. In addition to punch press operations obtainable with 32 different punches.

Automatic Sheet Layout Slashes Production Time

TODAY'S PRODUCTION ENGINEER, caught between increasingly acute manpower shortages and record production requirements, must seek the solution to his problems by concentration in one or more phases of production engineering.

Roughly, these categories are: (1) product design and selection of workable materials; (2) proper basic machines; and (3) special tooling and engineering of standard machines.

Faced with all the war-time difficulties common to metal-working industry, production men in the Milwaukee shops of Allis-Chalmers Manufacturing Company have achieved remarkable accomplishments on one unwieldy and tedious sheet metal job through special en-

ARTHUR GLADE

SUPERINTENDENT
ELECTRIC CONTROL PLANT
ALLIS-CHALMERS MANUFACTURING COMPANY

gineering and tooling of standard equipment.

Through the development of a largely automatic layout mechanism and its application to a standard Weidemann indexing punch press, Allis-Chalmers has slashed production time by 85 per cent on the fabrication of sheet steel marine electric control panels demanding a large number of various size holes and louvers.

Though several other types of machines are used on this production job, special tooling of the punch press

has accounted for the most substantial portion of the fabricating time saved on this normally tedious layout and punching operation. The press, which has reduced fabricating time on one typical job from 12 hours to two hours per unit, is used with slight variations in tooling on 65 different models of control panels and sheet metal parts required in electrical products turned out by the company for the armed forces.

The majority of control panels fabricated by Allis-Chalmers in this Weidemann press require from three upward to a maximum of 234 punching operations on $\frac{1}{8}$ " steel sheet. The automatic layout mechanism imposes no limit on the number of operations which can be performed on

Without tedious layout work in the shop, complicated sheet metal parts are produced accurately and swiftly through use of a semi-automatic layout mechanism applied to a standard indexing punch press

one sheet in the press; but 234 is the largest number that has been demanded of one setup on a single job to date.

Obviously, the press is not unusual for the 32 separate stations in its circular, rotating turret; but it is singular for the engineering of the work-piece table which operates in combination with the indexing head. As a result, every conceivable type of flat sheet metal layout is performed semi-automatically by the machine. Responsibilities of the worker are reduced primarily to feeding stock, setting the machine controls according to a sequence of operations sheet, and removing finished parts.

Most of the savings in fabricating time achieved by the setup result from automatic layout on the work-piece. Layout is facilitated by a shifting work-piece table. Sheets ranging from 10 gauge to 22 gauge mild steel—hot or cold rolled—are fixed to the table with turnbuckle clamps. The table accommodates sheets up to 52" wide, 102" long.

The table is moved by hand-crank feed either horizontally beneath the punch press turret, or in or out beneath it. Regardless of how involved the work layout may be, all that is required of the operator is to set the work-table as specified in an operations sheet, index the press turret so

that the required punch moves into working position, and press the punch operating button.

Sheet layout, involving selection of punches and positioning of the work-piece table, is performed by the Allis-Chalmers shop engineering department. For setting up and running a production job, the press department is supplied a long, 12" wide sequence of operations chart which is fixed on two spools for unwinding and rewinding by the press operator.

All directions for completion of the job are listed on parallel lines on this operations chart. Reading from left to right on each horizontal line on the chart is (1) the punch number, (2) the position of the work-piece table from left to right, and (3) into the machine.

This sequence of operations chart is attached to the control panel on the press, where it is easily reached and read by the operator. After completion of each operation, the chart is unrolled sufficiently to lift the next horizontal line of press setup instructions into view.

The table position is indicated in inches from the left side and inner edge of the work-piece, and the table is set as directed by the operations sheet through the use of linear scales on the table controls.

TURRET HAS 32 PUNCHES

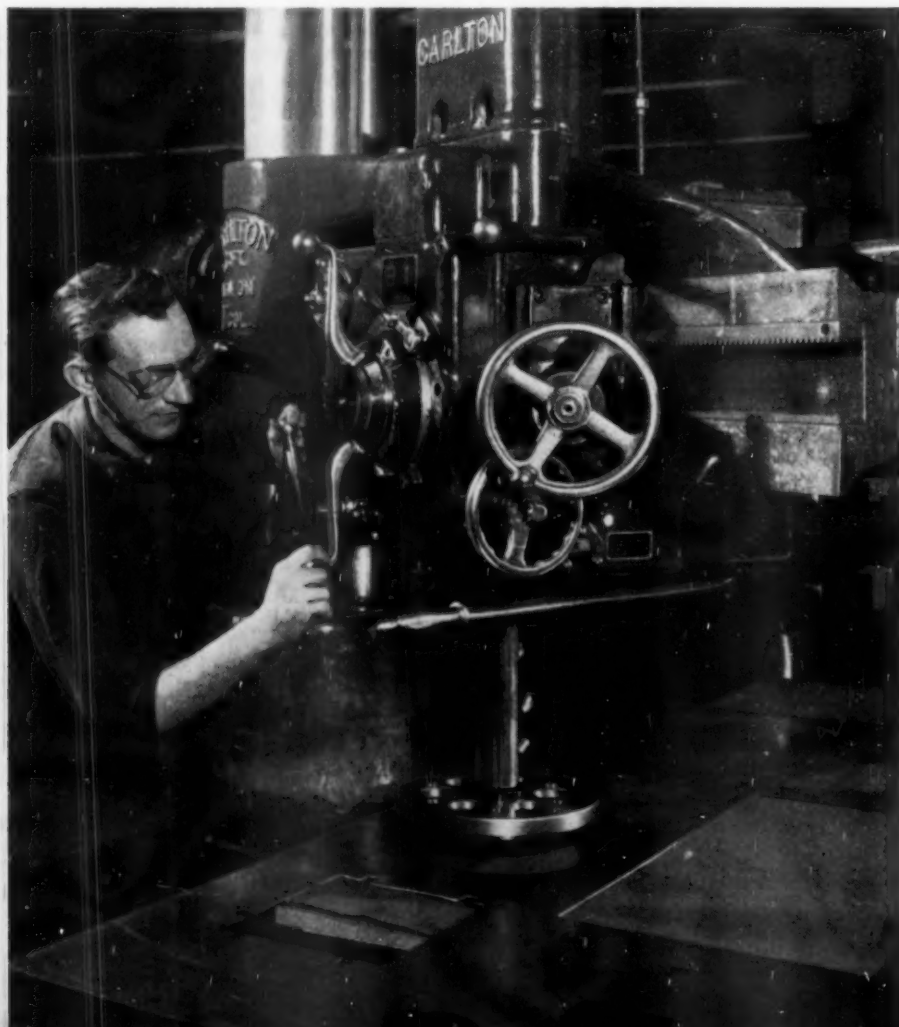
The position of the 32 punches in the Weidemann turret, including a 9/16" diameter center punch used for layout work, is changed infrequently. Selection and positioning of the punches in the turret is predetermined by the shop engineering department, which specifies that a punch of a certain size and design should be located in each tool position.

Punches used on the Milwaukee operation, believed to be one of the first installations of its type, range from 7/32" diameter to 6" square. These include, in addition to the center punch, louver punches of two sizes.

Though holes in excess of 6" diameter cannot be produced with the tools, this Weidemann press will accommodate, location of holes of larger dimensions can be determined automatically as a regular press operation. Consequently, substantial time ordinarily consumed in such layout work after sheets leave punch presses is saved.

THE TOOL ENGINEER

Holes larger than 6" diameter are produced by fly-cutters or with this Allis-Chalmers-built circular saw mounted on a drill press. A 9/16" diameter layout hole is produced on the punch press, and this circular band saw mounted in the bottom of a flat tool head is used to finish a smooth, uniform cut.



The center of such large holes is determined and noted in the sequence of operations by the engineering department. An operation, using the 9/16" center punch as a location point and pilot hole for tools later used in making a larger hole, is included in the work sheet.

Most holes in excess of 6" diameter cut in the 1/8" thick stock used by Allis-Chalmers on the electric control panel job are produced with an adjustable fly-cutter mounted on a light drill press. Fly-cutters are used in this manner to produce holes up to 14" diameter. The work-piece is positioned and secured by clamps to an adjustable table beneath the drill press.

Depending on the type and thickness of the material, as well as the requirements of the finished job, another method of cutting larger holes sometimes proves more satisfactory. This method embodies the use of a circular saw designed and produced in the Allis-Chalmers tool rooms.

This circular saw is simple in design. Though not adjustable for diameter of the cut, the band saw may be replaced easily as it is secured in a shallow slot in the bottom of a permanent head with a 9/16" diameter pilot for insertion in the previously punched center hole.

This tool produces a smooth, uniform cut, and prevents tearing and snagging which sometimes occurs when a fly-cutter is used.



Selection of the punches and work-piece table position is predetermined for each production job by the shop engineering department, and recorded on an operations sequence sheet mounted beside the press controls.

One of the most automatic sheet metal production operations yet devised, this punch press set-up enjoys as its chief advantages the complete elimination of layout work in the shop with resulting tremendous savings in manhours on each work-piece.

Drilling, nibbling and filing rough edges ordinarily produced by drilling

for large diameters in sheet stock are completely eliminated by the use of this machine and its fixtures.

Productionwise, in addition to laying out the work, this single punch press set-up performs operations which generally necessitate the work to be moved from machine to machine.

THE END

PROFILE MILLING TO FORM

THROUGH UTILIZATION of a simple fixture, an easy, practical method of accurate profile milling radially and to form has been developed in the Steam Division, Westinghouse Electric & Manufacturing Company.

The part is fastened to the fixture with two hollow head screws through holes used to hold the part in place in the regular apparatus.

The fixture is of segmental type. Radial and cross motion are obtained through the fulcrum pin at the lower bearing. The cutter is set axially and the feed is obtained by turning the handwheel, which in turn rotates the worm, wormwheel and a special gear meshing with the pins on the hardened cam plate. The path of travel is obtained through a hardened pin which acts as a pilot and fol-

lows the groove in the cam plate. A sufficient number of cuts are taken to obtain required depth.

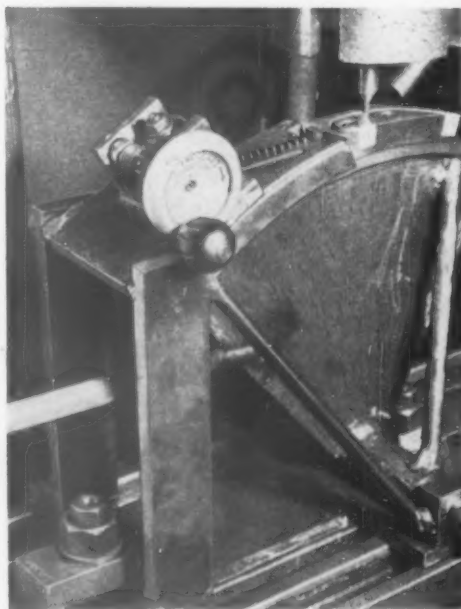
This fixture eliminates all hand finishing, and may be used on any machine having a vertical spindle. With this fixture, semi-skilled operators can produce accurate work.

The handwheel, worm and wormwheel are standard parts from stock.

L. BLAKE

Fixture of segmental type for accurate profile milling radially and to form. All hand finishing is eliminated.

Westinghouse photo



Carbide-Tipped Lathe Centers

REDUCE REJECTS

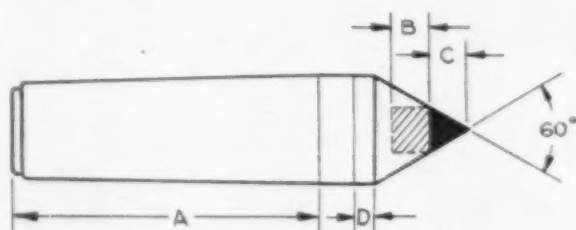


FIGURE 1. Carbide-tipped lathe center.

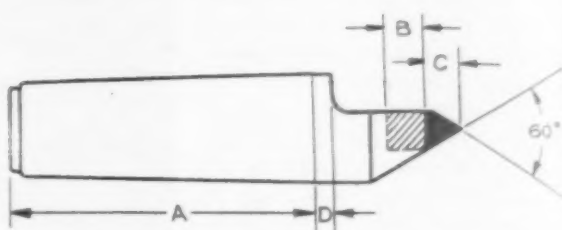


FIGURE 2. Carbide-tipped lathe half center.

Proper application permits taking full advantage of longer life and closer tolerances in finish grinding and turning operations

AN ELEMENTARY UNDERSTANDING of operation and maintenance of tungsten-carbide-tipped lathe centers shows that objections to their supposed fragility and inability to withstand pressures are unfounded. Their use in industry has shown that carbide tipping of lathe centers presents decided advantages in longer life and in holding to closer tolerances in finish grinding and turning operations.

Repeated tests of carbide-tipped centers compared with high-speed steel centers have shown that the carbide type will take equal or greater pressure, properly exerted, and with far less wear. This low rate of wear, of course, materially aids in maintaining concentricity and holding to close tolerance.

CARBIDE WEAR RESISTANCE

The carbide-tipped center also compares favorably with the live center in wear resistance. Although the work in a live center turns with the tip, the ball or roller bearing on which the center tip revolves is subject to wear. The slightest play in this bearing will cause run-out and make precision finishing impractical.

In one large plant producing torpedos for the Navy, the grinding of seamless steel tube sections to tolerances within .0002" had become a difficult problem. It was found that spoilage could be reduced by 90 per cent by substitution of carbide-tipped

DELMER RHINO

PLANT SUPERINTENDENT
WENDT-SONIS COMPANY

centers in both the head and tailstock of each machine.

Close tolerance, reduced spoilage, and longer tool life, are chief advantages from the use of carbide-tipped centers—if they are properly used and maintained. This, however, can be boiled down to two simple related requirements:

1. The portion of the tipped center carrying the load should have as close to 100 per cent bearing surface as possible.

2. Precaution should be taken that the tip is not struck or bumped.

The first requirement can be usually met by careful attention to lapping female centers of the work piece. In fact, no precision grinding or turning job should ever be attempted without this.

STORAGE IS IMPORTANT

Although carbide-tipped centers are made of the most wear-resistant material so far developed and will withstand intense thrust, friction, and heat, carbide has the characteristic of being brittle under impact and the tip is likely to chip or flake when struck, losing a certain amount of the essential bearing surface. When not in use, carbide-tipped centers should always be kept in the tool rack or in the original box.

Manufacturers of carbide-tipped

centers have recognized that, while the centers will normally stand up for months without even a regrind, tips may become chipped or broken. For this reason the carbide tip is set into the shank for a distance varying from one-half to the full length of the protruding portion of the tip.

In case of chipping or breaking, the tip can be reclaimed with maximum diameter intact by merely grinding back on the original angles. The shaded section of Dimensions B and C on Figures 1 and 2 show the amount of carbide insert in proportion to the exposed tip. Since the taper length "A" does not extend to the tip, the center can be ground back as far as "D" if necessary.

SELECTION OF LUBRICANTS

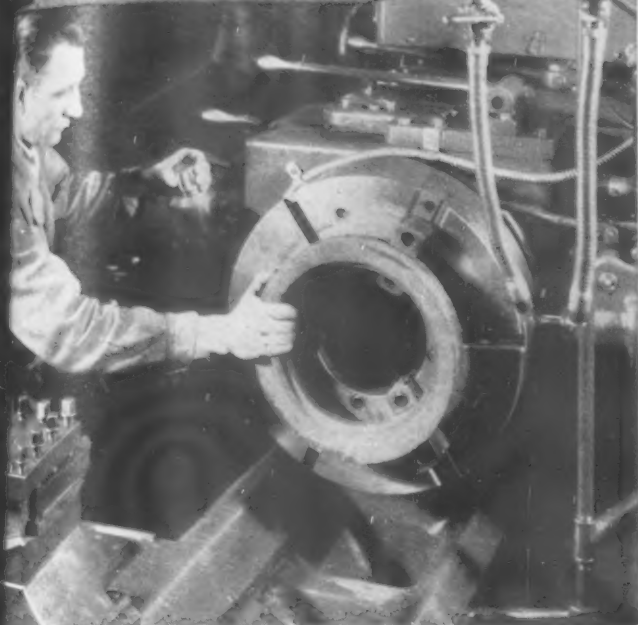
The same type lubricant can be used for carbide-tipped centers as for high speed steel, white lead being the most common. If the shank of the center is hardened, the tool will not lose its original taper angles.

When the amount of time and labor lost by spoilage on finishing operations is considered in relation to the closer tolerances achieved by use of carbide-tipped centers, the advantage of such centers for finishing operations is clearly shown. This production saving can be increased with a definite reduction in tool cost by merely observing the simple precautions outlined above.

THE END

THE TOOL ENGINEER

This



Not this!

FOR FASTER CHUCKING
FOR EASIER CHUCKING
FOR TIGHTER CHUCKING

A TURN of a knob on the Warner & Swasey Power Chuck Wrench and the work piece is gripped tight—much tighter than a couple of husky men using an extension pipe on a hand wrench can grip it, giving it "everything they've got".

Warner & Swasey Power Chuck Wrenches on your turret lathes can save much valuable time on each chucking—reduce operator fatigue—and enable heavier cuts to be taken without breaking tools or spoiling the piece because of work slippage.

Or the Warner & Swasey Power Chuck Wrench can be dial-set for light, uniform holding grip on thin-walled, fragile pieces.

It all adds up to faster production!

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . .
WITH A WARNER & SWASEY

**Warner & Swasey Power
Chuck Wrenches can be
installed on your current
model turret lathes**

If you are doing light or heavy chucking work, better find out quickly what a Warner & Swasey Power Chuck Wrench can do for you—in faster production, less scrap loss, and better satisfied operators. See your Warner & Swasey field representative or write Warner & Swasey, Cleveland, Ohio.

**WARNER
&
SWASEY**
Cleveland

Carbide-Tipped Lathe Centers

REDUCE REJECTS

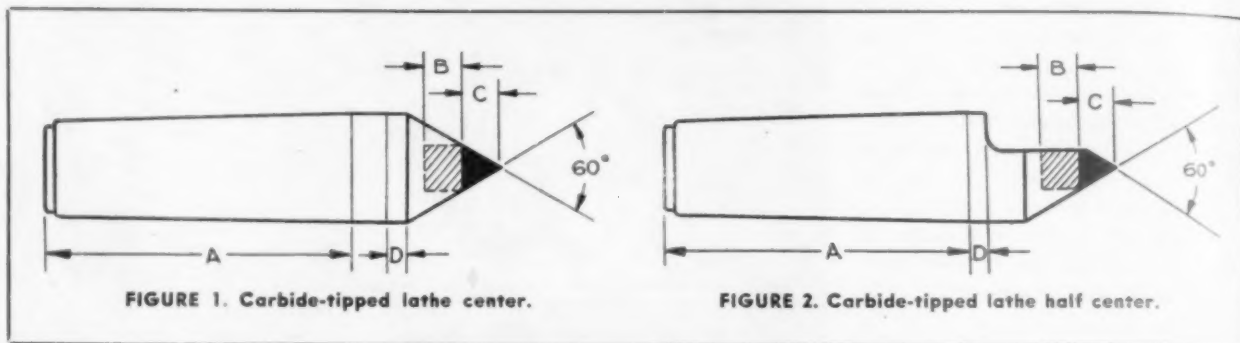


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PLANT SUPERINTENDENT
WENDT-SONIS COMPANY

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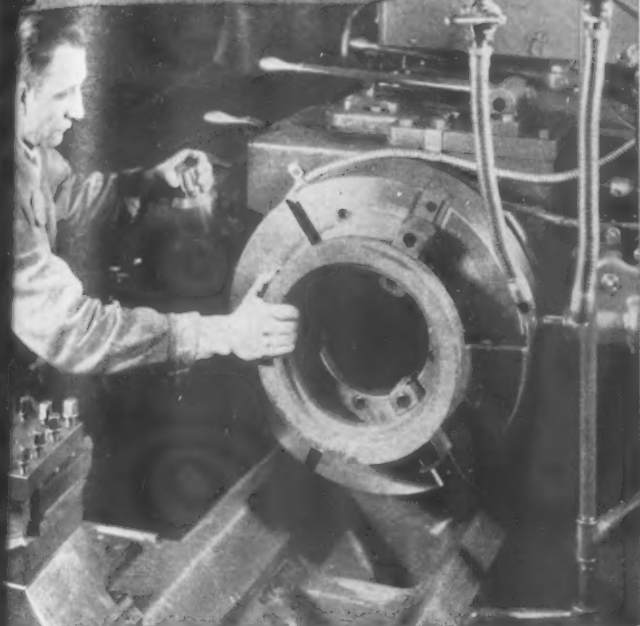
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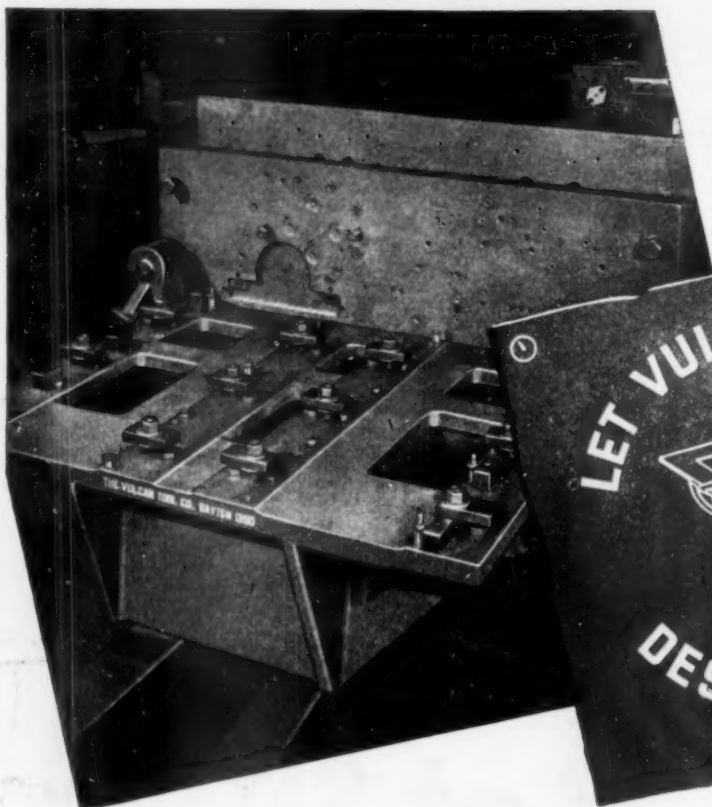
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**YOU CAN MACHINE IT BETTER. FASTER. FOR LESS . . .
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**WARNER
&
SWASEY
Cleveland**



Drill jigs to drill mounting holes for fly wheel housing and gear case in cylinder block, and gear case cover. 2, 4 and 6 Cylinder Diesel engines. Designed and built by the Vulcan Tool Company.



Blueprint FOR TOMORROW

The difference between a blueprint for tomorrow and a post-war plan is like the difference between an iron penny and a paper dollar—99 cents—which is quite considerable. It takes lots of time, engineering experience, and designing skill to change plans into blueprints. Vulcan has a proved service to offer now to those who want blueprints on deck for the pattern shop and tool room the minute the war orders are cancelled.

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ENGINEERING • DESIGNING • BUILDING • GAUGES • TOOLS • DIES • JIGS • SPECIAL MACHINERY

PRODUCTION DATA SHEET

PRODUCTION ENGINEERING CHECK LIST

PRODUCTION "HEADACHES" can be avoided with foresight. One of the country's largest plane plants had to be enlarged because insufficient space had been planned for parts storage on the production line. As might be expected, this late provision did not entirely compensate for faulty planning.

With a thousand and one things on his mind, today's production engineer is vulnerable to the error of neglecting to provide for the multitude of requirements of the average war production job. He may find

himself equally estranged from the once familiar routine of peace-time tooling, when postwar conversion begins.

The check list published here is offered to assist the production engineer in making a thorough examination of the fundamental factors of intelligent, alert tooling. Provided to cover a broad range of requirements, much of the list is not applicable entirely to every job. However, with a part print before him, the planner will readily note the applicable items.

PRODUCT DESIGN

A. PRODUCT FUNCTION

1. What is the product used for?
2. Is it a precision instrument?
3. Is it used alone, or in conjunction with other units?

B. PIECE PART DESIGN

1. What is the function of each member?
 - a. Can parts be omitted or combined?
 - b. Can a component be broken down into two or more parts to ease machining burden, and then be joined by brazing or welding?
2. What are the physical requirements of the finished product? Can diecasting be applied? Can synthetic or waste material be used?
3. Is any member subjected to abnormal stresses?
4. Is any member structurally weak, requiring care in application of clamps or machining pressures so as to prevent distortion?
5. Is a surface coating necessary to prevent corrosion, or to localize surface treatment?
6. Does design permit ease of assembly? Can redesign be effected to facilitate production, without affecting function detrimentally?
7. Will members require special handling?

FABRICATION

A. COST

1. What is allowable manufacturing cost?

B. PRODUCTION REQUIREMENT

1. How many parts are required? When?
2. Should entire requirement be made in one run?
3. What will be the replacement requirement?

C. MACHINE AND TOOL REQUIREMENT

1. Can parts be made on automatic machines?
2. Can stampings be used?
3. Is idle equipment usable?
4. Is special equipment needed which is not available in the shop? What will it cost?
5. Is a similar part made in the shop, so as to permit duplication of tools, jigs, fixtures?

(Concluded on reverse side)

NOTE: This is the thirty-second of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

THE TOOL ENGINEER FOR JUNE, 1944

D. MANPOWER REQUIREMENT

1. Are special skills required?
Will training be necessary?
2. Can women do the work?
3. Can physically handicapped men do the work?

PROCEDURE

A. MANUFACTURING SEQUENCE

1. Can operations be combined?
2. Can a series of operations be performed on automatic machines?
3. Will special attachments for standard machines speed production or combine operations?
4. Will jigs and fixtures aid in holding dimensions, preloading, combining operations, lowering non-productive time?
5. At what points should inspection be performed?
By whom?
6. What percentage of parts should be inspected?
7. Are gaging setups required?
8. Will proposed tooling hold to specified tolerances, permitting economical and efficient balance of rough and finish operations?
9. Is special handling equipment necessary?

B. PLANT LAYOUT

1. Is "in-line" production applicable?
2. Is complete manufacturing space available?
Must more be added?
Can layout be considered for this project only?
Can similar projects be assimilated?
3. Can this job be run over a line now set up?
4. Is a similar part being purchased, the manufacture of which might be incorporated economically with this job?
5. If the entire facilities of a department are required, which can be changed most quickly and most economically?
6. Can parts fabrication and assembly be grouped to minimize work handling?
7. Are parts storage areas necessary to assure even flow to assembly?
8. Is a salvage department required?
Can it be located close to the job?

C. ASSEMBLY

1. Are sub-assemblies advantageous?
2. Would assembly jigs or fixtures be helpful?
3. Can automatic or combination tools be used?
4. Are there likely points of hold-up, requiring a concentration of manpower?
5. Is a performance test required?
6. Does equipment design permit the operator to work efficiently?
7. Should auxiliary stations be provided to take care of emergencies?
8. Is each operator equipped with proper tools, jigs, and fixtures?

D. FLEXIBILITY

1. Are there impending design changes?
2. How radically may models, design changes differ?
3. Can permanent lines be set up for long runs?
4. Should many small lines be used, or one big one?

E. SAFETY

1. Has the operator been protected from injury?
2. Are tools protected from uneconomical wear, and from unnecessary breakage?



T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

Prevent Thread Deformation

Tool Holder Adjusting Post

Technical drawing of a tool holder assembly. The drawing includes a side view, a top view, and a perspective view of the assembly.

Dimensions and Labels:

- Side View Dimensions:**
 - Overall length: $2\frac{3}{4}$
 - Distance from left end to start of thread: $\frac{1}{2}$
 - Thread length: $\frac{5}{8}$
 - Distance from end of thread to center of hole: $\frac{1}{4}$
 - Thread specification: $1\text{'-15 THREAD } 2\text{' LONG}$
 - Flat section length: $\frac{3}{4}$
 - Overall width: $\frac{1}{8}$ sq.
- Top View Label:** $\frac{17}{32}$ HOLE FOR STUD
- Perspective View Labels:**
 - TOOL HOLDER DRILLED & TAPPED FOR STUD AT REQUIRED HEIGHT
 - ADJUSTING NUTS
 - NUT & WASHER TO HOLD POST IN PLACE

THESE SIZES MAY VARY FOR OTHER TYPE OF MACHINES

THE TOOL HOLDER adjusting post

- THE TOOL HOLDER adjusting post shown in the accompanying sketch and schematic diagram will permit machine operators to move the tool holder without the aid of a hammer. This prolongs the life of the holder

A technical drawing of a mechanical assembly. It shows a vertical shaft passing through several components. At the top, a bracket is secured with a bolt and nut, labeled 'D'. Below this, another bolt and nut, labeled 'C', are shown. The shaft then passes through a flange with a wavy outer edge. Below the flange, the shaft is secured with another nut and washer, labeled 'A'. At the bottom, the shaft passes through a block labeled 'B', which has a circular hole and a slot. The entire assembly is mounted on a base.

Handy Transfer Tool for Transferring Holes on Mating Parts

To use the transfer tool, the proper bushing, straight or threaded, is placed over the shank of the transfer tool and the combination is then inserted in the hole to be transferred. The mating piece, in which the transfer is to be made is then placed in the proper relative position, resting on the head of the transfer tool.

A tap with a hammer on this piece is then made and the transfer tool center punches and makes the guide circle in the proper alignment for the machining operation.

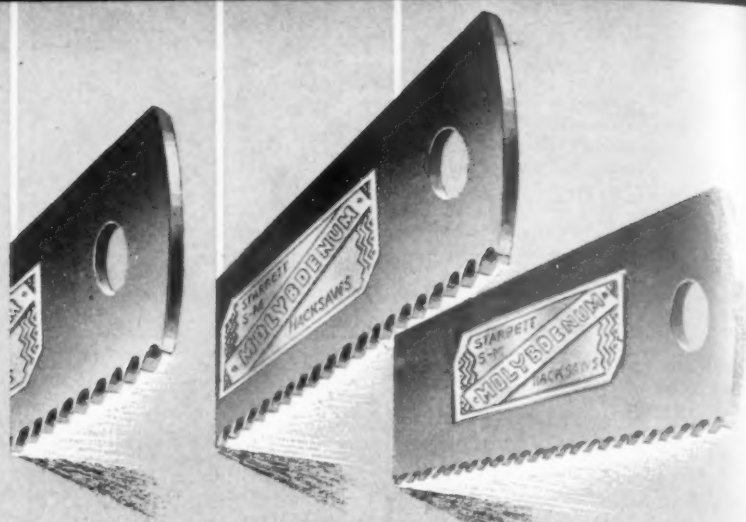
This inexpensive tool and method takes away guess work when laying out holes on two parts to be fastened together. The tool can be used successfully on small or large work.

A number of straight bushings are made with the diameter "A" to suit various sizes of drilled, reamed or bored holes in parts. Screw bushings are also made with the threaded diameter to agree with threaded holes in pieces.

The figure consists of three separate technical drawings illustrating different types of slip fits:

- Left Drawing:** Shows a cross-section of a rectangular piece of "MACHINE STEEL" with height $\frac{1}{8}$ " and width "A". A smaller rectangular piece of "TOOL STEEL HARDENED" is shown being inserted into a notch cut into the top surface of the machine steel. The dimensions of the notch are labeled as $\frac{3}{8}$ " SLIP FIT and $\frac{1}{8}$ " NOTCH.
- Middle Drawing:** Shows a cross-section of a T-shaped assembly. The vertical stem is "MACHINE STEEL" with height $\frac{1}{8}$ ". The horizontal base is "TOOL STEEL" with total width $\frac{1}{2}$ ". The base has a central slot where the stem fits. Dimensions include $\frac{1}{8}$ " for the stem's width, $\frac{3}{8}$ " for the slot's width, and $\frac{1}{8}$ " PIN indicating the fit. The top surface of the tool steel base features a dovetail-like shape with a $\frac{1}{8}$ " dimension across its top edge.
- Right Drawing:** Shows a cross-section of a rectangular piece of "MACHINE STEEL" with height $\frac{1}{8}$ " and width "B". It has a dovetail-shaped hole. A corresponding dovetail-shaped piece of "TOOL STEEL HARDENED" is shown fitting into it. The dimensions are labeled as $\frac{3}{8}$ " SLIP FIT and $\frac{1}{8}$ " NOTCH.

JUNE, 1944



MORE CUTS PER DAY
MORE CUTS PER BLADE

When You Stick to STARRETTS

STARRETT is a good name to look for—and to specify—on any blade, whether it's *Standard Steel* for hand sawing, *S-M Molybdenum* for hand or for light and heavy power saving, or *High Speed Steel* for power sawing of extra hard alloys. Starrett standards of quality and uniformity have been steadfastly maintained. You can continue to count on blades carrying the Starrett name or label.

Ask your mill supply distributor for Starrett Hacksaws.



THE L. S. STARRETT CO.
ATHOL, MASSACHUSETTS, U. S. A.
World's Greatest Toolmakers

Now, with Service Star

Announcing the New STARRETT "SAFE-FLEX"



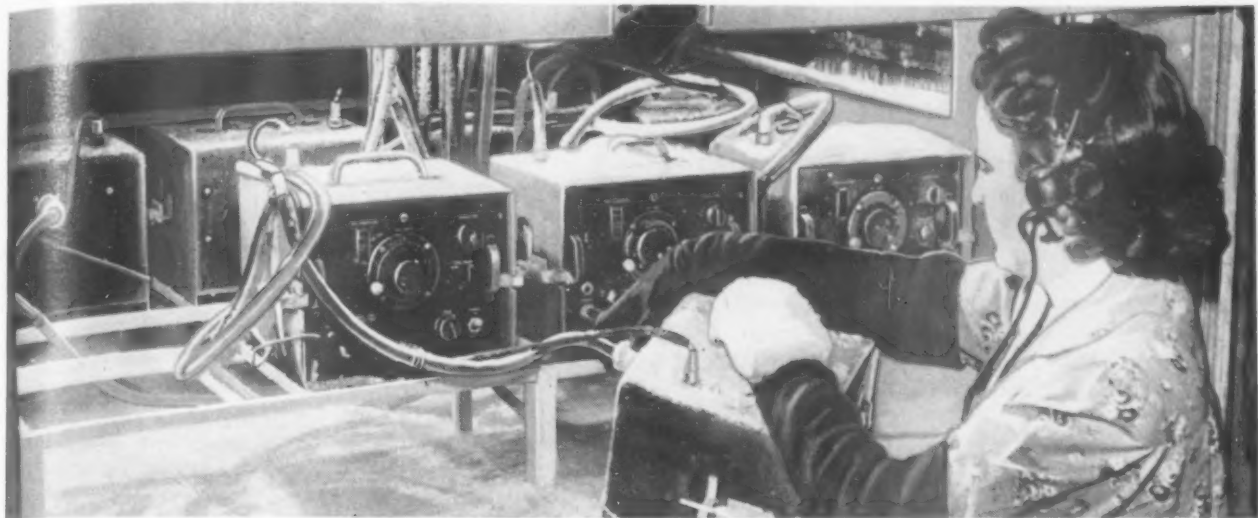
Class A, High-Speed Steel Hacksaw Blade with the *Flexible Back* and *Hard Edge*—a combination that's *virtually unbreakable*.

Try this new STARRETT "SAFE-FLEX" blade on hand-sawing jobs where the going is rough and the cutting is tough. It comes in 10 and 12 in. lengths, 14, 18, 24 and 32-tooth blades. Ask your mill supply distributor for STARRETT "SAFE-FLEX" Hand Hack-saw Blades.

STARRETT

**PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES**

MEN • MATERIALS • MACHINES



PRODUCTION TOOLS:

Air Conditioning and Refrigeration

IN the fabrication and assembly of metal parts, air conditioning and refrigeration can serve in the never-ending battle against the three saboteurs of perfection—uncontrolled temperatures, widely varying relative humidities, and air-borne dust.

Extremely close tolerances, high operating speeds, and heavy production rates established by industry have made it necessary to control these factors in eliminating rejects and in producing perfect equipment.

In metal-working plants, laboratories are constantly testing metals to make sure that they meet specifications, particularly as to the required alloy content. By means of a device called a spectrograph these analyses can be made quickly. An electric arc is drawn between sample metal electrodes and a light beam from this arc, directed by lenses and prisms, is focused on sensitized film. For this analysis to be accurate, lenses and prisms must be free from dust, lint, and marks from perspiring hands, and relative humidity must be kept constant to assure consistent

L. GALE HUGGINS

ASSISTANT MANAGER
AIR CONDITIONING DEPARTMENT
WESTINGHOUSE ELECTRIC ELEVATOR CO.

Sub-Zero Refrigeration Boosts Production

Chilling spot-welding electrode tips increased number of welds between cleaning of tips 1000 per cent in one case.

Another outstanding application of sub-zero refrigeration is the use of such equipment as the Deepfreeze -120° F cabinet for cold treatment of cutting tools.

Reports show that production increases up to 500 per cent between grinds after cold treatment are not unusual.

Eastern Aircraft—
Frostrode Products photo



Bendix Aviation photo War-Spurred Refrigeration Testing Will Improve Postwar Goods

First utilized by automobile manufacturers, the sub-zero test room has gained wide use in war production. Above are frost-covered aircraft radio instruments undergoing 65°-below-zero tests at the Bendix Aviation Corporation.

Sub-zero testing is expected to be an important aspect of final inspection on many products turned out by the mass-production industries after the war.

performance of the arc interrupter device.

Emulsified plates or films must be stored under carefully controlled conditions of temperature and relative humidity to prevent their deterioration and subsequent poor results. Constant temperatures are important also in maintaining a fixed focus in the optical equipment. Air conditioning provides the answer to all these problems by accurately maintaining the temperature, humidity, and cleanliness of the air in the enclosed space.

An interesting example of industrial air conditioning is found in a plant producing reduction gears. Cutting these large gears requires up to 17 days time. Any temperature change of the machine or work re-

jects mount, tool breakage increases, accuracy declines, certain types of abrasive wheels deteriorate rapidly because the bonding compound softens, many man-hours of time are lost because of the dermatitis rash caused by splashing of the hot coolant, and much coolant is lost through evaporation.

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The answer to these problems is found in use of mechanical refrigeration units which control removal of the heat absorbed by the coolant and hold it at approximately room temperature. Industrial refrigeration applications for control of coolant temperature are becoming almost universal.

Interchangeability of parts, delicate controls and mechanisms in newly-developed high speed machines of war, and standardization of design suitable to mass manufacture have created a demand for production fineness and accuracy.

But no piece, large or small, can be more precise or accurate than the gages used to check it. Gages out of calibration through misuse or which have been checked against a master gage under widely varying conditions lead to misfits and resultant costly rejects.

TEMPERATURE TOLERANCES

Air conditioning in the gage testing room is a valuable aid in protecting gages from the damaging effects of widely varying temperature, relative humidity, and dirt. The temperature is usually held at about 68° F dry bulb and the relative humidity at about 50 per cent. Tolerances are usually held at $\pm 1^\circ$ F, and relative humidity is generally held within ± 5 per cent of the desired point. Because of the danger of destructive condensation on gage surfaces, excessively high relative humidity must be avoided.

Refrigerating spot welding electrode tips materially increases the number of welds it is possible to make between each cleaning of the welding tips. In welding aluminum, refrigeration of tips has increased the number of welds per cleaning by as much as 1000 per cent.

The electrode tips are chilled by water circulated through a specially constructed tip holder. Some authorities advocate the use of Prestone mixed with water to allow the temperatures to be brought below 32°F. However, frost accumulation and the

temperatures to be brought below 32°F. However, frost accumulation and the

Cold Room Holds Parts In "Soft" Condition

This big refrigeration room at the Hudson Motor Car Company holds aircraft parts "soft" between heat treating and working of the parts.

Through the protection afforded by this low-temperature room, many hours of re-heat treating of parts not being worked are saved.

Hudson Motor photo



sulted in minute inaccuracies that caused the gears to be noisy in service, and relative humidity had to be kept low to prevent condensation on the gear and tools.

Enclosed rooms, varying in size from 12' x 14' x 16' to 32' x 38' x 18' were constructed around each of the hobbing machines. Construction is of two steel walls with insulation between. Each of the 25 rooms is air conditioned by a unit containing a cooling coil, a heating coil, a compressor of either $3\frac{3}{4}$ or 5 hp, and thirteen evaporative condensers, each handling two condensing units. A temperature of 750° F dry bulb, held within 1° prevails, and relative humidity is held at approximately 60 per cent.

Such "spot" air conditioning is ex-

to blend tap water with artificially heated water or to temper it with water from an automatically controlled refrigerated water chilling system to hold the temperature desired.

Mechanical refrigeration has provided the answer to many of the problems incidental to continuous, grueling, war-time operation of machine tools. When such equipment is operated continuously at high speeds, the temperature of the coolant continues to rise until its heat loss throughout its path of circulation and through evaporation is equal to its heat absorption at the point of contact.

In some cases the coolant temperature may rise to over 130°F. As a result of this high temperature, re-

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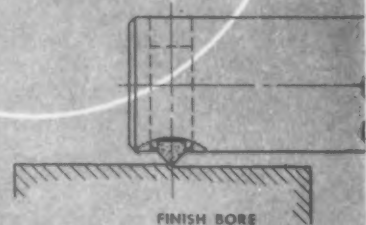
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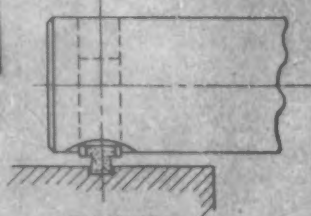
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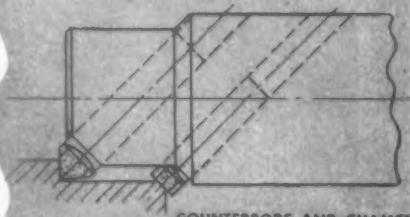
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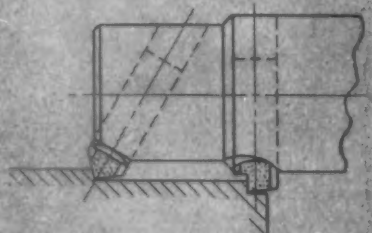
FINISH BORE



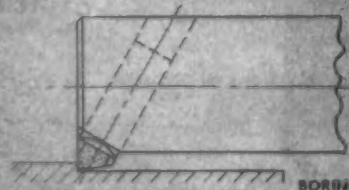
GROOVING



COUNTERBORE AND CHAMFER

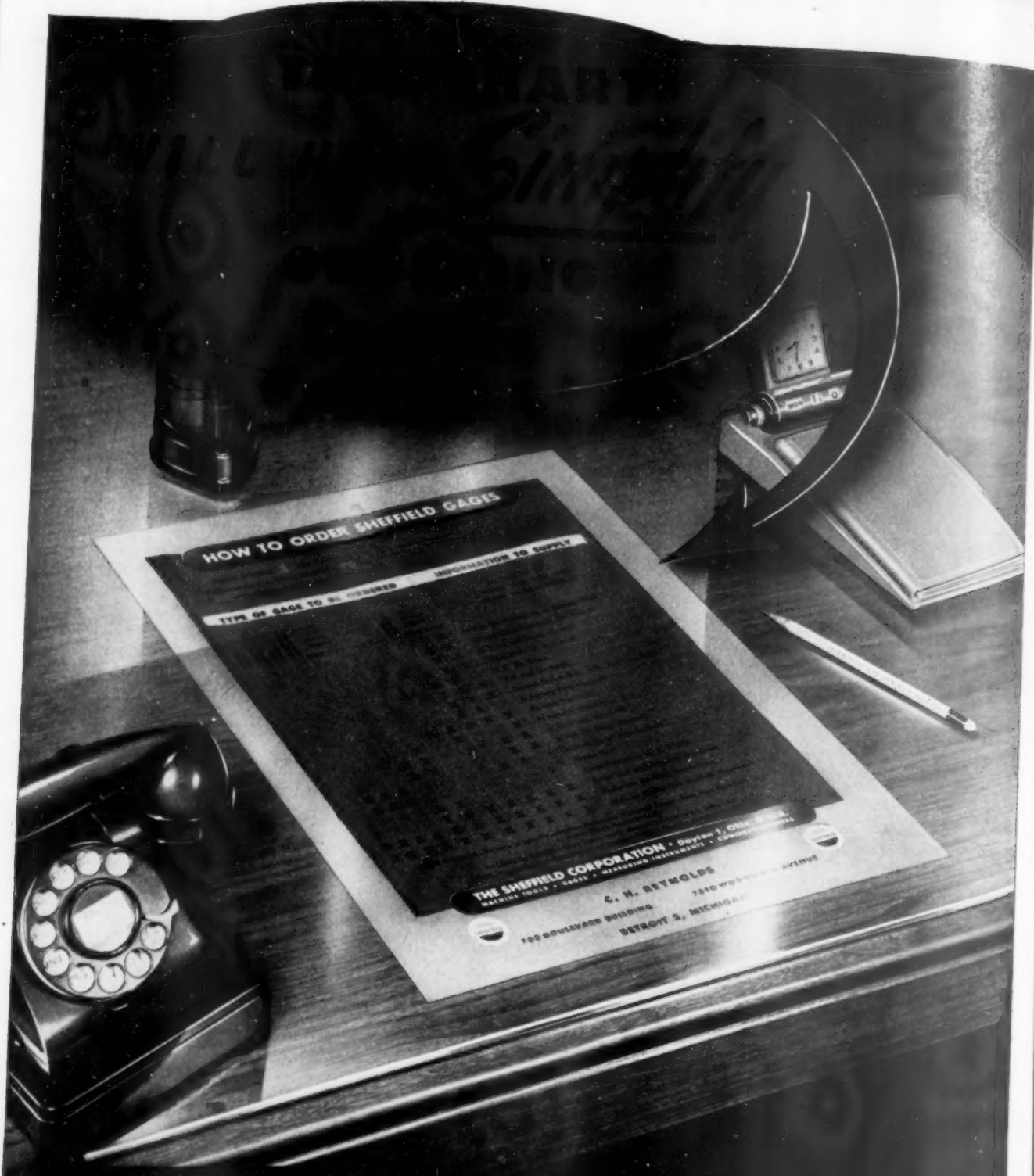


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ROUGH BORE

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MEASURING INSTRUMENTS • CONTRACT SERVICE



Ford Motor photo

Temperatures are Closely Controlled the Year Around in This Spacious Tool and Die Shop.

One of the most spectacular utilizations of air conditioning and temperature control in industry is found in the Ford Motor Company's Rouge Plant Tool and Die Shop. Believed to be the largest tool shop in the world, it is completely air conditioned. Inside, winter and summer temperatures never vary. Advantages in intricate tooling are obvious.

consequent dripping water from the defrosting which results during shutdown are objectionable, and one series of tests showed relatively small additional benefits to be derived from reducing liquid temperatures below freezing temperatures.

One proposed specification for welding aluminum calls for water temperature below 40°F. and not above 75°F. Recommendations by various authorities indicate that a water temperature of 40° F will give satisfactory results. The equipment required consists of a condensing unit, a water chilling unit, and the necessary valves and control equipment. For welders with ratings of 15 to 100 KVA, condensing units ranging in size from ½ to 3 hp are approximately the required capacity.

An ingenious method of "shock testing" armor-piercing solid shot for stresses, strains, and invisible cracks consists of a series of alternate immersions of the shot into chilled water and hot water. The water in the two chilled water tanks, is maintained at 60° F by means of automatically controlled mechanical refrigeration units. The series of insulated tanks is usually built into the production line and the wire baskets

containing the shot, progress through the alternate cold and hot tanks by conveyer or are manually carried.

In the manufacture, use, and storage of abrasive wheels and sandpaper, controlled conditions of temperature and relative humidity contribute much to the production of a superior quality product and to its longevity.

In fabricating abrasive wheels, in which abrasive grains are bonded together by compositions such as bakelite, ceramics, hard rubber, or sodium silicate, it is important that the proportions of grain sizes be closely measured. While the abrasive grains themselves are not hygroscopic, they must be kept free from moisture to allow accurate weighting of the grains.

CONDITIONS GOVERNING HUMIDITY

Where the bakelite bonding material also is in grain form when mixed with the abrasive grains, it is likewise important that excessively high relative humidity be avoided, owing to the hygroscopic nature of the unpolymerized bakelite. If the bakelite is in liquid form when the abrasive grains are added, the room temperature should be controlled to as-

sure a constant consistency of the bonding fluid.

When the bonding material is a ceramic clay, relative humidity control prevents lumping and assures a uniform mix of ceramic and abrasive grain.

If sodium silicate is used as the bonding material, the finished wheels are hygroscopic to a certain degree and, unless used and stored in an atmosphere free of excess humidity, will deteriorate. Flexible type wheels, in which the abrasive grains are cemented or glued to the surface, are usually made of laminated woven cotton fabrics. In the manufacture and use of this type wheel, low temperature and high relative humidity cause the glue to jell and prevent proper packing of the abrasive on the wheel head.

Sandpaper, when stored for any protracted period, should be stored in a controlled atmosphere. If the relative humidity is too high, the paper absorbs moisture and the glue is softened. In the case of too low relative humidity, the glue dries out and the abrasive grains become detached, impairing the abrasive qualities of the sandpaper.

THE END

MACHINE TOOLS

... news and trends in the
Machine Tool Industry ...

Shipments Rise and Increased 1944 Volume is Predicted

Up for the first time in months, machine tool shipments rose nearly one and one half per cent in March to reach a total value of \$50,799,000. Value of shipments the previous month was set at \$50,098,000 by the Tools Division of WPB.

Peculiarly enough, the spurt in March was the first in exactly one year. In March 1943, shipments momentarily jumped to \$125,445,000, contrasted with \$114,594,000 the month before.

Total orders received in March this year were valued at \$41,854,000, an increase of 19.6 per cent over the February total of \$34,995,000. February orders likewise showed an increase, having jumped 12.7 per cent over those in the first month of the year.

Increases in orders during the early part of this year are attributed by WPB to increases in war production scheduling of trucks and aircraft engines, as predicted in this department. Foreign orders, mostly Russian, also contributed to the swelling orders.

Cancellations in March totaled \$1,847,000, an increase of 7.1 per cent over cancellations of \$1,725,000 the previous month. Thus, net new orders for March—total orders less cancellations—were \$40,007,000, compared with net new orders of \$33,270,000 for February.

Despite the rush of order writing, the overall trend of the industry continued downward. Production still exceeds orders. WPB set the backlog of unfilled orders for machine tools at the end of March at \$155,079,000, a decrease of 6.9 per cent from the \$164,424,000 backlog at the end of February.

Early predictions that the total volume for the year would reach \$375,000,000 now appear safe, even if orders hit greased skids late in the summer. The suggestion that 1944 business might far exceed this figure was first made in statements by industry leaders attending the Westinghouse Annual Machine Tool Forum in Pittsburgh late in April.

In one discussion of the business outlook at that meeting, it was suggested that a flood of Army orders would raise the total volume another \$100,000,000. The first concrete proof of this came in Cleveland May 8, when the Army Ordnance called upon machine tool builders gathered for their semi-annual meeting there to rush delivery of approximately 1,000 machines for a heavy shell program.

With war production requirements unpredictable because of the shifting strategy of world-wide conflict, similar "emergency" programs demanding additional machine tools may come from the Army at any time.

Industry Urges Utilization of Idle Machine Tools

WASHINGTON—More drastic steps to find and utilize idle machine tools were urged by the Machine Tool Industry Advisory Committee at its last meeting here with the W. P. B.

In view of unexpected demands that the armed services have indicated, the committee said presently planned production of the industry was inadequate and these new demands could be met only by better utilization of existing machine tools.

This appeal from the builders stems from an industry-wide situation. As machine tool orders declined during the past year, individual builders took on increasingly large direct and sub-contract war production jobs of other types. Sufficient capacity of their plants was reserved to meet existing machine tool requirements and to work off the order backlog. Now, the in-

Builders Promise Cost-Cutting Machines at Annual Spring Meeting

CLEVELAND—"Do we have to wait until the war is over before we can talk to a manufacturer about the fact that a new machine tool might help him cut his costs? Is it heresy to suggest that new machine tools might even help out the costs of war production and thereby lessen the expense to the taxpayer?"

These questions were posed by J. Y. Scott, President of the National Machine Tool Builders' Association, speaking at the organization's spring meeting May 8 and 9.

Many a business statistician already has measured a coffin for the machine tool industry. Come the end of war production, the slide rule boys have announced, and the burden of a decade's normal output crammed into two or three years will be more than all but the most firmly established concerns will be able to shoulder.

RE-ENGINEERING DEMANDED

On-the-record statements and a hotel lobby survey of builder-opinion and industry attitude at the Hotel Cleveland meeting failed to reveal the pessimism which usually accompanies crepe hanging.

Affable, Jim Scott, who, as President of the Van Norman Company, well knows the cyclonic rise and fall of the machine tool sales barometer, struck the keynote of the two-day session attended by more than 300 representatives of the industry.

"I'm telling you right now that after this war," Mr. Scott said, "cost-cutting is going to be just about the biggest problem in the entire industrial field.

industry is faced with a sudden demand for more machine tools, and men and machines must be found to handle the additional business.

The committee recommended better utilization of both government and privately-owned tools to fill the gap they foresee between new requirements and their own ability to fill expected orders without slighting their new war contracts.

WPB officials advised the committee that the industry's production of \$157,246,000 in the first quarter of 1944 amounted to less than 45 per cent of the first quarter 1943 production of \$357,243,000. WPB revealed that out of a total of \$1,800,000,000 in machine tool "pool orders" placed with the industry through the Defense Plant Corporation during the period of peak demand, there remained only about \$33,000,000 worth of machine tools and attachments that had not been sold to war industries as of April 15.

This figure, it was said, was less than two per cent of the total "pool orders" placed. Incoming orders from individual concerns, WPB stated, is steadily reducing this figure.

Reflecting the builders' interest in industry-placed orders, the builders again urged that WPB field offices act promptly on applications to purchase new machines when existing tools are not available or suitable.

You know that wages aren't going down, and you know, too, that if prices keep on going up, American industry won't be able to get the mass markets needed to sustain high-level postwar employment.

"It is up to us right now to do so good a job of re-engineering and re-designing that when the war is over, American manufacturers can continue to pay high wages and at the same time put their products on the market at prices that the masses of people in this country and in other countries can afford to pay."

EXCESS POSTWAR FACILITIES

In every formal report of the meeting, in every informal conversation on postwar business outlook, Mr. Scott's admonition was reiterated. The builders are out to produce machines that will cut costs.

What to do about the greatly expanded productive facilities of the industry, come the end of the war? The Association's President offered a succinct reply. "Either make definite plans right now toward cutting down our plants, facilities and operations to fit our estimates of the postwar machine tool demand; or add to our sales lines some other products."

Unlike many a consumer manufacturer, the machine tool builders are welcoming all offers of product criticism. In a blistering session, the entire industry heard in Cleveland the same report representatives of selected concerns received two weeks earlier from General Motors production men.

(Continued on following page)



Tell Berna, General Manager of Builders' Association, calls for return of competitive enterprise.

Builders had good reason to listen to Harold T. Johnson, Director of GM Standards, and G. T. Bates, time and motion study engineer. The number one autobuilder is using 150,000 machine tools today, 64,000 of which are government-owned. Of the latter, the Corporation's divisions may be able to reconvert to peacetime use about 10,000.

The postwar plum the visitors from Detroit dangled before sales-conscious builders was a promise of orders for 20,000 machine tools. The money has been appropriated, the orders will be placed immediately they said, and all that is holding up the job is government refusal to give the "green light."

Mr. Johnson listed 10 questions machine designers might ask GM, then provided answers.

Later, with the help of slide films, he pointed to "bad design and bad placement of power units and accessories". Although nearly every machine tool design was slam-banged by the GM engineers, builders took it gracefully, admitted that improvements could and would be made.

AUTOMEN DEMONSTRATE WITH MOVIE

Nonetheless, even GM itself would admit that on some points their criticisms are debatable. In an effort to dramatize the fact that sometimes it requires a day to tear a machine down and five minutes to perform the actual repair, the automen cited every conceivable design fault. For some of these designs, incidentally, they have been at least partly responsible.

Citing the fact that production costs include all the time a work piece is in a machine, Mr. Bates suggested improved designs tending toward more semi-automatic operation and a sharp reduction in the worker movement at the machine. The frequency or distance a worker must move his arms, back or feet to control a machine tool, he said, governs the time required to perform a finished operation.

Dramatizing his remarks with a movie which depicted excessive worker movement at the machine, Mr. Bates suggested (1) that all controls be located so that the operator is in a normal posture; (2) eliminate unnecessary motions; and (3) make necessary motions as short as possible.

The General Motors machine tool film, which will be available soon for

general distribution throughout industry, would indicate that the foot and toe work of an industrial Pavlova is required to operate some of the newest models. Even the worker's desire to eliminate some of this "fancy foot work" was reflected in pictures of crude extensions for machine controls.

Reduced to their barest essentials, here are the G. M. requirements:

Standard parts, controls and accessories should be standardized to reduce repair stock. Model designations should provide complete information on capacity and power requirements.

Because of new cutting tools, speeds and feeds must be increased sharply.

VIEWS ON POSTWAR MACHINES

As a result of the maintenance problems posed by hydraulic feeds, GM is leaning toward mechanical types.

Wartime emergency finishes are not satisfactory, and machines should be painted in two colors with the work areas in lighter hues for safety.

While more accurate work may not be demanded of postwar machines, they should be more rigid to produce present tolerances at the increased machining rates now used.

A major criticism of present equipment is poor chip disposal. With wider utilization of high-speed turning in the offing, it was said, the disposal problem may become serious.

"CRAZY" DESIGNS NOT WANTED

Though builders received a pat on the back for the present lubricating systems, a complaint that ways should be de-mountable to permit regrinding was reported from numerous plants. Ground and hardened ways are wanted, Mr. Johnson said, but in too many instances the machine now must be returned to the builder for regrinding.

If electronics can reduce machining time, GM wants electronic controls. Mr. Johnson, however, threw out a warning. "We don't want any Rube Goldberg designs that require all day to find one loose wire".

Speaking for one of the most effective trade organizations in American business, Tell Berna, General Manager of the National Machine Tool Builders' Association, called upon the builders to educate machinery users to the profit-making potentialities afforded by the possession of equipment of the latest type, to convince industry of the pressing need for regular and routine machinery replacement.

Conservative, but business-wise, Mr. Berna deserves credit for clear thinking on the economic phase of the postwar machine tool outlook. "With thousands of excess war-built machines available at knocked-down prices," he

told this reporter, "you won't be able to sell new machines in many industries unless the user is convinced that postwar models will cut his manufacturing costs. That is a sales and advertising job for machine tool men."

For a comparison of the British and American attitudes regarding governmental approach to the postwar machine tool problem, Mr. Berna read a report from Adolph Foerster, Cincinnati Milling Machine Company, now in London with the Foreign Economic Administration.

"I feel that the British consider maintenance of a sound, well-balanced machine tool industry to be a very important matter," Mr. Foerster wrote.

"Therefore, I believe that they will continue their controls into the postwar period, taking their machine tool industry at a prewar pattern and reducing output to whatever volume is considered necessary to maintain the industry. Output at this level will



J. Y. Scott, President of Association and Van Norman Company, cites postwar industry problems.

probably be considered as part of the government pool of machine tools already in existence at that time, and allocations will be made from this pool to industry—also to fill requirements of liberated areas and export markets."

Commenting on Mr. Foerster's appraisal of British machine tool planning, Mr. Berna struck a responsive chord among the American business men at this meeting.

"Whereas Mr. Foerster assumes that government control of the machine tool industry will be part of the long-term policy of the British government," he said, "machine tool builders undoubtedly will prefer termination of government controls and return to the competitive enterprise."

Electronic Controls and Carbide Milling of Steel Featured at Westinghouse Forum

PITTSBURGH—Attracting the largest gathering of engineers from the machine tool industry in its nine year history, the Westinghouse Annual Machine Tool Forum was held here May 1 and 2.

The immediate necessity of postwar planning and a definite trend toward more automatic machine operation

were the main themes which developed in business and technical sessions attended by 525 industry representatives. Registration was almost double that at last year's meeting.

Though the primary purpose of the meeting was to study the possibilities of machine tool electrification and electric control, technical topics of discus-

sion ranged from research advancements in materials and new developments in carbide milling of steel, to "give and take" sessions on hydraulics versus electronics in machine control.

From the standpoint of the economic phase of the machine tool industry, the meeting was news productive through observations by several speakers. Disposition of excess war-built machine tools, postwar business potentialities and the necessity for improved machine designs were major considerations.

Widespread thinking among the builders themselves on the subject of excess machines was reflected in the observations of Tell Berna, General Manager, National Machine Tool Builders' Association. The surplus problem, he insisted, can never be solved by government control through



F. S. Blackall, Jr., President & Treasurer, Taft-Peirce Manufacturing Company, Forum speaker.

storage for an indefinite period. The time to get them sold and out of the market, Berna pointed out, is during the period of relative prosperity expected when industrial reconversion is at peak level. If the government attempts to hold used machines longer, it was reasoned, they would eventually flood the market, probably at a time when new machine tool selling already was highly competitive.

One news nugget that was music to many a builder was the statement—repeated several times—that 1944 machine tool sales would reach \$475,000,000, fully one hundred million more than the level officially anticipated by the War Production Board.

VIEWS ON POSTWAR MARKETS

On the general postwar business outlook, Westinghouse Vice-President, F. D. Newbury predicted an inability of American industry to sell machinery on the foreign market without government subsidization, but visualized a very substantial domestic market with an emphasis on unit cost reduction in every type of mass production.

Postwar machine tool market potentials were mirrored in statements by Newbury and Andrew H. Phelps, Vice-President in charge of purchases, that his company's postwar sales were expected to average 175 per cent of the pre-war volume, and that machine tool purchases by the Pittsburgh concern since the beginning of 1940 have ex-



E. L. Spray revealed the machine tool requirements of a large manufacturer.



F. D. Newbury addressed the Forum on postwar plans of his and other companies.



Head of purchases, A. H. Phelps said his company will buy postwar machine tools.

Westinghouse Vice Presidents Address Forum

ceeded \$30,000,000.

"Talk to your friends, congressmen and senators," J. Y. Scott, President, National Machine Tool Builders' Association and President, The Van Norman Company, begged in an impassioned plea to arouse interest in lifting now the restrictions on machine tool builders so that work can commence on the production of the first "critical" machines that will be needed to shorten the reconversion period in American metal working industry. "Let's not have a lapse in our economy that will permit the public to blame American industry", he said.

ELECTRONIC CONTROL HISTORY

Significance of the Forum, with its interchange of technical information between highly competitive industries, was described as a "vindication of our economic system and proof that the profit motive does engender constructive effort for the benefit of all". This observation was made by Frederick S. Blackall, Jr., President & Treasurer, Taft-Peirce Manufacturing Company, who was the main speaker at the Forum Dinner.

Three speakers from Westinghouse presented papers at technical sessions. W. L. Bendz, the company's District Engineer from Boston, explained the theory of Mot-O-Trol, tracing the history of this electronic adjustable speed drive back seven years its initial development.

MATERIAL RESEARCH CITED

Electronic speed and load controls for spindle and feed motors and a tracer mechanism in which a .001" movement of tracer will give an accurate electrical response were described by G. A. Caldwell, Westinghouse Industry Engineering. This mechanism and other electrical devices were demonstrated in an exhibition held in connection with the Forum.

The race between material research engineers and machine tool engineers to develop cheaper, better materials on one hand, and cheaper production methods on the other, was discussed by Dr. A. A. Bates, Manager, Westinghouse Chemical & Metallurgical Department.

Though sessions on electrification and controls were well received, climax of the technical meetings was the presentation of an illustrated study of "Carbide Milling of Steel", by Dr. H.

A. Frommelt, Director of Research, Kearney & Trecker Corporation.

Introduced by Warner Seely, Secretary, Warner & Swasey Company, Dr. Frommelt offered complete engineering data on tool design, speeds, feeds as well as extensive production figures on the use of carbide tipped cutters in the milling of steel.

"The subject of carbide milling of steel is variously referred to as 'Hyper Milling', 'Negative Rake Milling' and 'Negative Angle Milling'", Dr. Frommelt said. The peacetime use and application of this technique "is assured and, while it may never replace entirely the older cutting materials such as 'High Speed'", he added, "it is safe to assume at the present stage of development that the majority of steel operations will in the future be effected with benefit of carbide-tipped multi-



Dr. H. A. Frommelt, Kearney & Trecker Corporation, described research in carbide milling of steel.

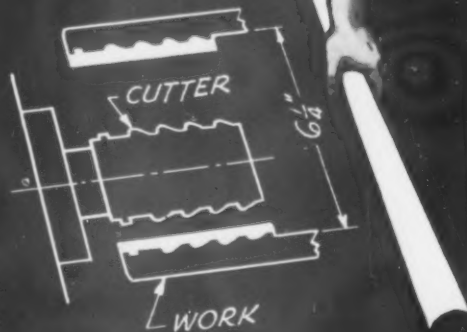
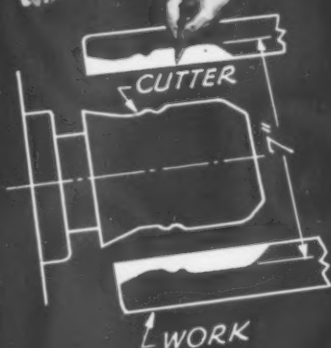
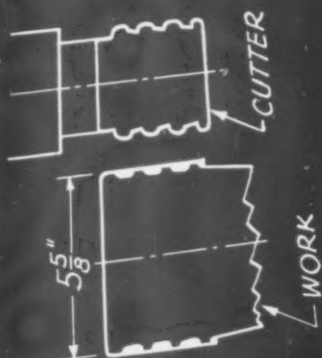
toothed cutters.

"The technique of milling steel with carbide is presently limited to the use of negative angles both in the rake and the helix. This is not true if we included the lower Brinells and Semi-steels where positive angles are quite effective. But for reasonable cutter life under every day shop conditions, negative angles, both rake and helix, seem to be necessary to the success of this procedure in the milling of steel and its alloys," he explained.

Dr. Frommelt pointed out that Carbide Milling of Steel (Concluded on page 110)

FORM MILLING WITH
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IS FASTER AND
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FORM milling of cylindrical parts is just one of the jobs Plan-O-Mill performs with outstanding success.

TIME is saved because of Plan-O-Mill's many rapid production features—including General Electric Thy-mo-trol for separate and complete control of feed-in and feed-around.

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—MACHINE TOOLS—

(Concluded from page 118)

bide Milling demands relatively high surface foot rates. "Friction and abrasion are carbide's worst enemies; the use of peripheral speeds that range from 500 to 1000 feet per minute apparently lessen the abrasive effect of the carbide tip while in the work."

He suggested lower surface foot rates—400 to 500—for heat treated steels of 375 to 425 Brinell. High finish—15 to 20 micro inches—call for high surface foot rate and low chip load, he said.

Experiments indicate "definite advantages of high chip loads," he continued. "The thicker the chip the farther from the cutting edge will the cutting forces be applied. This assists in preventing the breakdown of this cutting edge and increases cutter life."

HIGH PRODUCTION INCREASES

Regarding feed rates, Dr. Frommelt presented case histories of production jobs on which feed was jumped $\frac{3}{8}$ " to 13" per minute and $4\frac{1}{2}$ " to 42" per minute. In the latter instance, spindle speed was increased from 54 to 1074 R. P. M. Production increases of as much as 100 per cent were cited.

Regarding horsepower consumption, Frommelt said that "since the peripheral speeds are 5 to 10 times higher than those commonly employed with high speed steel cutters, the rate of applying these cutting forces and, therefore, the horsepower consumption, is increased proportionately."

Generally, he explained, flywheels must be used.

Other technical subjects covered by papers included "Electrification Requirements of the Machine Tool Industry", by L. W. Scott Alter, President, American Tool Works; "Control Assembly Factors" by E. E. Opel, Electrical Engineer, National Automatic Tool Company, Incorporated, and D. K. Frost, Electrical Engineer, Mattison Machine Works; and "Electrical Equipment for Automatic Tools" by G. B. Carson, Research Engineer, and L. C. Cole, Chief Engineer, Cleveland Automatic Machine Company.

E. L. Spray, Manager, Westinghouse Headquarters Manufacturing Division, revealed his company's thinking in discussing the "Expectations of a Machine Tool User".

MACHINE RIGIDITY DEMANDED

Because of the inevitability of surplus standard machines, he said, something really new must be offered if more machine tools are purchased. Nonetheless, he pointed out, there will be a postwar market because the biggest problem in mass production after the war will be increased costs.

Labor rates will not go back, he said, and "the only solution lies in the field of increased productivity".

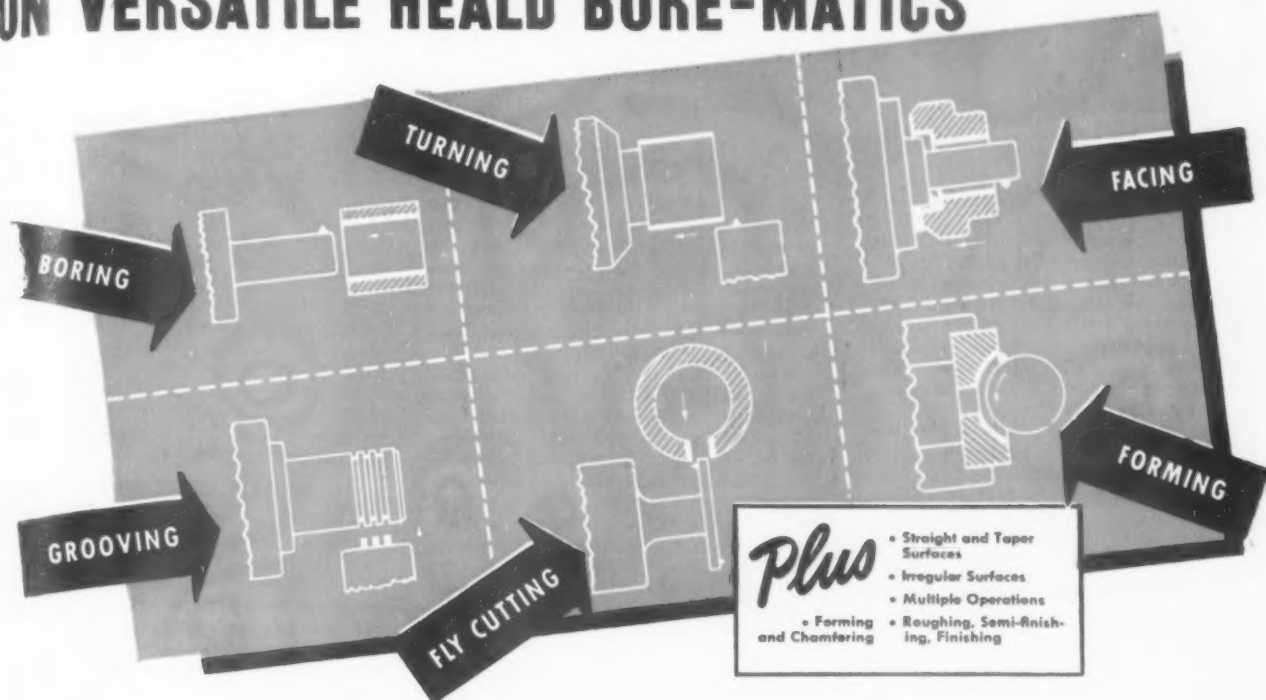
Discussing specific requirements in machine tool construction and design, Spray called for "increased rigidity and sustained accuracy."

"Only 5 to 10 per cent variation in speed may mean the difference between success and failure in holding tolerances with some of the new materials and cutting tools," he pointed out. "Consequently, speed control to a greater degree heretofore obtainable probably will be all important."

THE END

THE TOOL ENGINEER

Do all these Precision Jobs ON VERSATILE HEALD BORE-MATICS



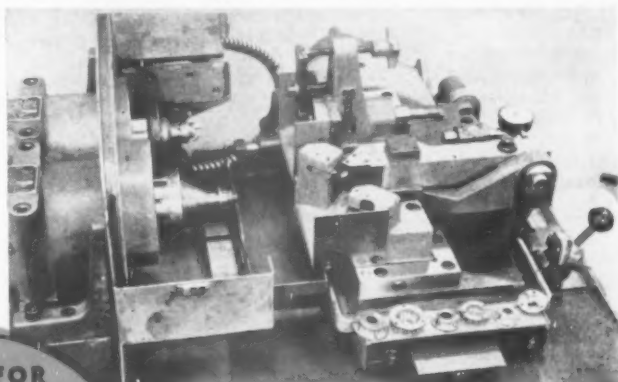
V. F. 1* ALL-PURPOSE VERSATILITY FOR ALL APPLICATIONS

Here's a way to hold size, roundness, straightness to tenths . . . get perfect squareness, concentricity, alignment . . . produce better finish, reduce or even eliminate final lapping and honing . . . boost production, lower costs . . . *this way*—Borize on Bore-Matics.

Such results are not limited to just one type of operation. Heald Bore-Matics are all-purpose tools—for all kinds of jobs, for all types of operations. Unusual flexibility gives them unusual versatility, makes it possible to execute boring, turning, facing, chamfering, grooving with equal efficiency. Either straight or taper surfaces can be machined, and also curved and irregularly-shaped surfaces. These operations can be accomplished singly, simultaneously, progressively or in combination. Nor are operations restricted to final finishing—roughing and semi-finishing can be done, too.

Heald Bore-Matics can help you meet postwar competition, aid in creating new

postwar markets—thru more precision, more production on all vital operations. Get the Bore-Matic story, now . . . The Heald Machine Company, Worcester 6, Massachusetts.



Borizing Gun Housings. Six operations—turn, face, chamfer, bore. Two stations. Single end operation. Rotary and stationary fixtures. Compound feed, table and cross-slide. Automatic cycle. Such versatility in Bore-Matic design permits ready adaptability to the exact requirements of every job.



HEALD *Bore-matics*

THE MOST VERSATILE MACHINE TOOL



CAPITAL COMMUNIQUE

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

T. N. SANDIFER

Special dispatch from THE TOOL ENGINEER'S Correspondent in the nation's capital.

WASHINGTON
DESPITE the recent flurry of postwar thinking stirred up when members of the Automobile Industry Advisory Committee met with WPB Chairman Nelson, the same problem that bothers other postwar planners cropped up—where to get the tools that will be needed, and where to find the space to set them up, before auto production can be resumed.

Chairman Nelson put a further brake on any optimism that might have been engendered by warning that auto production will not be possible until a general cut-back of at least one-third has been made in the war production program.

AUTO INDUSTRY WARNING

Since then, members of the industry have been given most of the arguments thrashed out in the meeting, so that it would seem pertinent to discuss some of those concerning machine tool operations as they were raised by various members of the committee. Some highlights of members' views, now before the industry for study and comment, are these:

Replacement of machinery that has either been sold or placed on war work, is an important problem, and one which would cause the greatest delay in getting back into production; the Government should work out some plan similar to that of Canada, for sale and disposition of machinery so that each manufacturer would know promptly, what would be made available to him.

JUNK-PILE MACHINERY

The automobile industry as a whole is 75 to 85 percent converted to war production; much of the machinery used in war production is worn out—even in peacetime replacement runs to 10 percent annually—so that it is important that Government authorize the companies to buy equipment used in war work, and to go into the market for replacements.

One member reported his company has 63,000 government machines, of which it could possibly use 15,000 to replace its own worn-out equipment and reorganize its production; of 83,000 machine tools of its own, he continued, some 17,000 were earmarked as special tools for automobile production, not usable on war jobs. He figured most companies would find that about 25 percent of Government-owned machine tools could be used for auto production, but most other members at the meeting thought 15 to 20 percent was a better figure.

Another member thought that machine tools and equipment made under war-time restrictions on materials and design might not be adequate or desir-

able for peacetime production; even now after only a couple of years' use, he claimed, they are approaching the junk-pile stage. He thought it was important to take off some of the restrictions on production of machine tools in order to use adequate materials to make good machines.

Analysis of the various members' views, as brought out in these discussions also finds that they are giving lots of thought to the space problem, one of the major factors now being investigated and to be reported on soon.

One manufacturer, for instance, pointed out that his whole plant is on war work, and bears no resemblance to an automobile factory any longer, except in the forge shop. In the event of a sudden collapse on the war front, he said, he would be faced with moving out machinery now on war production, and getting automobile machinery back in, and he could foresee a lot of time lost, and a considerable amount of unemployment in the interim.

ADVANCE PLANNING NECESSARY

Just as a detail, he added, because of fire hazard, he has had to remove water proof paper used to cover special-purpose machinery out in his yard. When he comes to move this machinery into the plant, he said, a tremendous overhauling job would be necessary. Of all his problems, however, this manufacturer considered floor space as the most serious.

Others advanced the thought that the Government would have to aid in this matter. The clearance of plants, it was further pointed out, involves real advance planning that should be done now.

It was argued also, with WPB officials, that the Government could help considerably if manufacturers could be told in advance, for illustration, that a certain size of tank would no longer be needed, when we get down to fighting Japan, or that the Navy has enough searchlights of a given type. Spreading

war work into a greater number of areas, and taking up the slack with peace preparations when possible, are other steps urged.

One WPB official has advanced the idea that a task group, now working in the industry, incidentally, should be asked to calculate lead factors on the various items involved, for instance, in reconvert the automobile industry; if the time lead factor one of these items was, perhaps 12 months, and not a great deal of activity was involved to produce important results, conceivably it might be worked into the war program. These factors, he said should be worked out for design, engineering, tools, equipment, machinery and materials, among other things.

Among recommendations now before government and industry is one that the Government make plans to speed up disposal of surplus materials, that it determine the prices at which it will sell government-owned machines and tools, and so notify industry, also that plans be made for prompt clearance of space when possible.

INDUSTRY SURVEY EXPECTED

Since these recommendations, it is worth noting that the Senate, in approving contract termination legislation, deliberately omitted the matter of disposal of surplus property, due to the amount of controversy now shaping around that question. However, the necessity of plant clearance is regarded in the Senate as of paramount importance, and will be dealt with accordingly, it now appears.

It will be recalled that an industry committee is now surveying the automobile field with a view to reporting back shortly on a number of the points that have been raised, and the more pertinent ones of which have been mentioned here.

WHEN WILL THEY MEET?

With respect to the survey of the automobile industry by the task committee mentioned above, following the meeting here, John Middlekamp, director of WPB's Automotive Division, has suggested that each company look over its plant, and spell out what it needs in the way of machine tools, plant space, and other requirements, necessary for getting back to its regular manufacture.

With this information at hand, he said, the industry advisory committee can reconvene and set up the industry group to work out a complete plan for the auto industry. A recent check

(Continued on page 114)

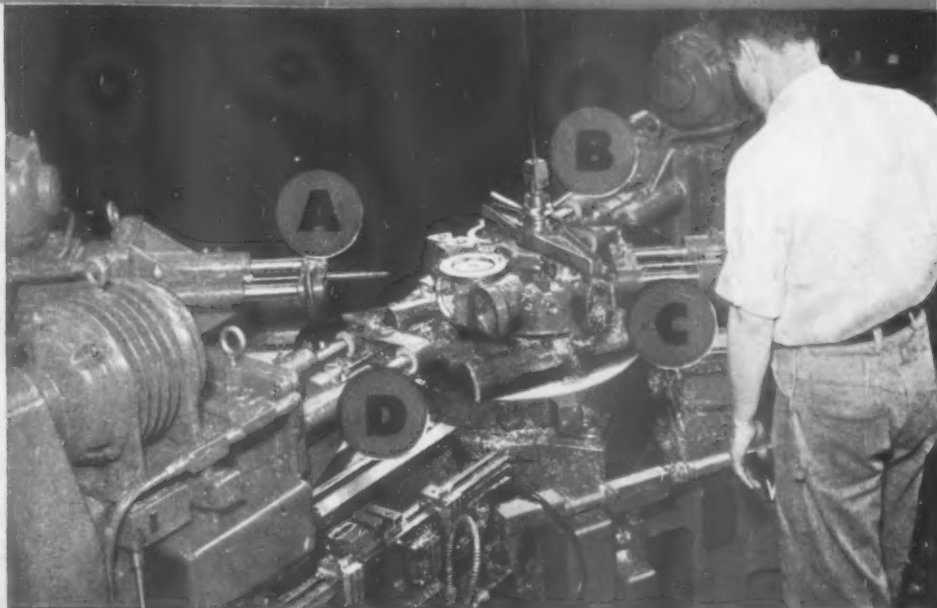
FROM THE WASHINGTON VIEWPOINT....

- ★ Auto manufacture out until war production has been cut-back at least one-third
- Estimates on number of DPC machine tools usable in peacetime manufacture range from 15 to 25 per cent
- Set prices on war-built machines and plan quick clearance of war plants, government warned by industry
- Re-tooling Army-Navy arsenals to take many excess machines.

4 SPINDLE UNIT TYPE MACHINE

*Cuts
Drilling
Time*

**FROM SIX
TO THREE
MINUTES**



Here's an increase in production worth noting. A large manufacturer of aircraft engines has been able to double his former rate of production by tooling the job on a W. F. & John Barnes unit-type, 4-spindle, 4-unit machine. Specifically, the 4 drilling operations which formerly required 6 minutes are now being performed in 3 — an actual saving of 3 minutes per case.



A Unit A Drill $21/64"$ Hole 2" Deep. **B** Unit B Drill $21/64"$ Hole 2" Deep. **C** Unit C Drill $1/4"$ Hole $5-9/16"$ Deep. **D** Unit D Drill $1/4"$ Hole $5-9/16"$ Deep.

TOOLING and OPERATIONS

Schematic diagram, at right, shows tooling used on this 4-unit machine. Operations are listed below.

NUMBER OF SPINDLES (First Index)

Unit A $21/64"$ Drill
Unit B $21/64"$ Drill

(Second Index)

Unit C $1/4"$ Drill
Unit D $1/4"$ Drill

ACCURACIES

Diameters .004"—.003"

Locations .010"

No. OF MACHINES REPLACED — 1

Production Record

Previous Production Rate
— 6 minutes
Present Production Rate
— 3 minutes
Savings — 3 minutes



Illustrated at the left is a W. F. and John Barnes 4-way 4-spindle Unit-Type Machine for machining airplane engine crankcase. Tooling for this job is illustrated above.



A SURE WAY OF DETERMINING WHETHER OR NOT YOU ARE USING THE RIGHT MACHINE FOR YOUR JOB

● W. F. and John Barnes Unit-Type Machines are increasing production rates in many shops throughout the world. Through education and practical experience in the special machine tool field, our engineers possess the necessary qualifications to design and arrange these units to completely satisfy your job expectations. We believe that some of the work at which you are now engaged can be done faster and with more general all-round economy on a unit-type machine. Why not investigate? Send us the complete details of your job, telling us what has to be done, the accuracy required and the rate of production desired. We will have our engineers make a careful analysis of them and then inform you of the possibilities of tooling the job on a unit-type machine. This advice is free of charge and will not obligate you in any way.

FREE

We have prepared two sets of booklets which contain valuable information for those engaged in any occupation where machine tools are used. In their disclosure of various machining problems and solutions they may suggest more productive tooling set-ups for you. They will be sent to you without cost upon request.



W. F. and JOHN BARNES

325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

COMPLETE EQUIPMENT FOR ADDING AN

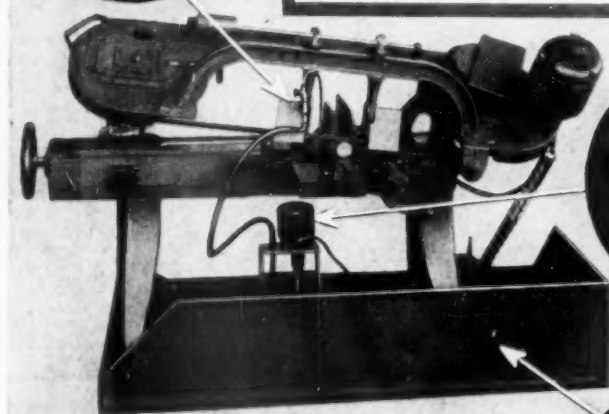
Automatic Coolant System

TO ALL MACHINE TOOLS

FEED
FITTINGS
11 Models
FOR ALL
TYPES OF MACHINE
TOOLS

NEW... FOR ALL HORIZONTAL BAND SAWS

Increase Production and Increase Blade Life—equip your saw for coolant cutting with a Gray-Mills Model S-30 system. You simply set the saw upon the coolant pan—hook up the feed tube—plug in the cord—and your saw is ready for wet cutting. Price . **\$79.50**



COOLANT
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9 Models
GEAR AND
CENTRIFUGAL
60 to 2200 G.P.H.
8 to 50 P.S.I.

COOLANT
RETURN PANS
10 Models
FOR ALL
TYPES OF MACHINE
TOOLS

The New S-30 System is an improved design of the Gray-Mills S-20 System. It has an improved gear type pump with automatic pressure relief valve.

Gray-Mills' exclusive slotted feed tube for saw blade application; the flow control petcock above the feed; control switch in the cord; and special forced-settling baffles for separating chips from the coolant are other S-30 features.

It's easy and economical to equip any of your machine tools with a Gray-Mills Portable Coolant System—to give them the tool-saving and production-increasing advantages of using coolants. Gray-Mills Systems include a complete range of pumps, coolant return pans and fittings for quick and simple application to most any machine tool. Varied pump capacities, both gear and centrifugal, are available to provide proper pressure and volume for the job.

See your distributor or write for complete details.



PROMPT DELIVERY
GRAY-MILLS CO.
1952 Ridge Ave., Evanston, Ill.

Complete Portable **COOLANT SYSTEMS**

FRACTIONAL H. P. PUMPS
INDUSTRIAL FLUID REFRIGERATING SYSTEMS

—CAPITAL COMMUNIQUE— (Concluded from page 112)

with Middlekamp indicated that no such committee meeting has been scheduled as yet.

Meanwhile, a survey of certain holdings of machine tools has been in progress, looking to a redistribution of these tools where necessary, to help in meeting current production needs.

800,000 MACHINE TOOLS BUILT

The reports, which cover available tools including government-owned units in various plants, have come in from about 50 per cent of the companies surveyed, but so far, WPB says, they are only from the smaller companies, and show about 8000 machines. When the big companies, such as General Motors and others of this category, are heard from, the expectation is that well over 20,000 tools will be found to be available. The WPB and the various government services, who are included in those holding possible surplus machines, are trying to get together in facilitating the check-up.

From unofficial sources, it is indicated that by the end of this year approximately 800,000 new machines will have been built for war industries, compared to about 1,000,000 machine tools in operation at the end of 1939 in this country. A large proportion of the new tools are government-owned. WPB says only about 150,000 probably have been built for private industry.

RE-TOOLING ARMY-NAVY ARSENALS

Probably a fifth of the government's machine tools, it is estimated, are special-purpose tools, which thus might not figure in the surplus.

Speaking of surplus tools, indications are becoming stronger that a lot of those now potentially in the way of peace-time developments may be absorbed by the Army and Navy in fitting out so-called stand-by-plants for reserve against future contingencies. Both Army and Navy, according to report, want to re-tool their arsenals and Navy yards, in addition. The Navy, through certain officials has definitely stated it is planning to retain a large number of the machines it now has.

Certain specialized machine tools, particularly adapted to Ordnance work, probably will be transferred from existing ordnance plants to regular Navy establishments. Others less specialized, will be used to re-tool older naval plants, such as the Naval Gun Factory, where much of the equipment is said to be outworn, or obsolescent. The Navy, it is understood, plans to make provision in its termination contracts, for sale of such machines as it does not require, to private manufacturers.

SURPLUS DPC UNITS SOLD

As a result of this program, the Navy does not currently, expect a large hold-over of war-used machine tools to be turned over to the Surplus Property Disposal unit under Will Clayton.

The Defense Plant Corporation, another government agency having surplus equipment, has just announced sale of 6429 surplus used machine tools, of which 4734 were sold within the government for continued use in war production, and 1695 to private purchasers.

THE END

THE TOOL ENGINEER



"Jimmy" will be Scouting again for you—Some Day

You recall "Jimmy," of course—that up-and-coming salesman of your Industrial Supply Distributor's ♦ who always went his rounds with eyes open for emergency materials he knew you were needing. Many times he found them, too—enough to keep you going until your next regular shipment reached your Distributor from the factory.

"Jimmy" still is a good scout—for you and for us all. Today he is helping to keep the sea-lanes clear but some day he'll be back again to his old job. You will be needing your Distributor then, too—and will appre-

ciate Jimmy's cheerful help all the more.

And meantime—your Industrial Supply Distributor is doing a swell job in spite of handicaps of men and materials shortages—he's working night and day to keep the things you must have, moving in on schedule.

Help your Distributor to help you by ordering as far ahead as you can. He probably can send what you need from stock—or already has it coming in. It saves your time—it helps keep your production rolling at top schedules—to

Telephone your ♦♦♦ FIRST!

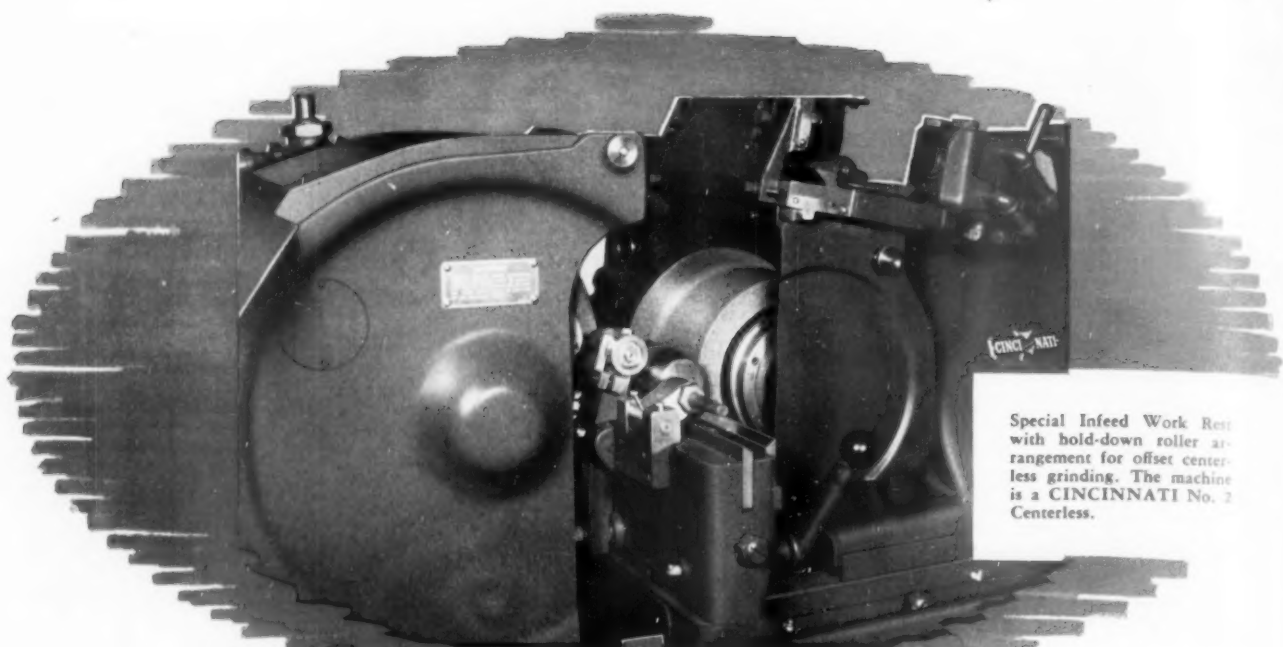


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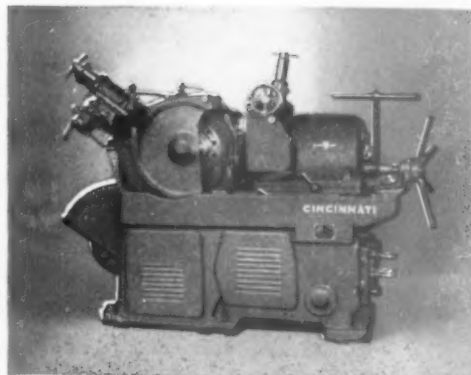
Special Infed Work Rest with hold-down roller arrangement for offset centerless grinding. The machine is a CINCINNATI No. 2 Centerless.

★ offset

CENTERLESS GRINDING

ANOTHER EXAMPLE OF CINCINNATI CENTERLESS KNOW-HOW!

To handle parts requiring an "offset" grinding operation, this CINCINNATI No. 2 Centerless is equipped with a special 8" Infed Work Rest featuring hand ejector, spring pressure hold-down rollers, two work blades and retracting end stop. The machine is also equipped with Hydraulic Profile Truing Attachment over the grinding and regulating wheels. ¶ When offset parts are centerless ground, this setup has two advantages: 1) The hold-down roller presses the part against the regulating wheel, maintaining contact and increasing the driving force. 2) It prevents any tendency of the part to cock between the wheels because of the grinding pressure being concentrated at one end. ¶ If your present operations or future plans call for grinding a wide variety of parts in various sizes, shapes or weights, metals or metal substitutes, the engineers here at Grinding Headquarters will be glad to discuss CINCINNATI grinding equipment with you. Or if you have any problem involving either centerless or centertype grinding, you will be wise to depend upon the know-how of CINCINNATI engineers.



CINCINNATI No. 2 Centerless Grinding Machine. Catalog G-456-1 gives complete details and specifications. Copy will be sent on request. For a brief description of all CINCINNATI Grinding Machines, look in Sweet's Catalog File for Mechanical Industries.

*"Offset" grinding on a CINCINNATI Centerless Machine means that the grinding wheel merely grinds a narrow section at one end of the part. The greater portion, or the entire length of the part, contacts the regulating wheel to assure adequate driving force.



CINCINNATI GRINDERS INCORPORATED

CINCINNATI, OHIO, U.S.A.

CENTERTYPE GRINDING MACHINES... CENTERLESS GRINDING MACHINES... CENTERLESS LAPPING MACHINES

PRECISION MANUFACTURE

... a review of significant developments and new techniques
in mass production industries ...

**New York Safety Council
Sponsors Foreman Training**

NEW YORK—Attacking one of the most serious deterrents to war production, the Greater New York Safety Council is sponsoring safety-training courses for foremen and a six-month inter-plant accident reduction contest to promote safe operations on the job.

Inter-plant accident reduction contest reports for March, showing five fatalities as compared with only two during the 1943 contest, and an accident-frequency rate of 12.44 against 15.70 for March 1943, are regarded as indications of the timeliness of safety training work.

The uptrend in accidents is ascribed largely to the influx of new and untrained workers replacing safety-conscious employees.

The contest, one of the largest in the country, involves 251 industrial plants employing 162,000 workers. Total accident exposure is estimated by the Council at 200,000,000 man-hours for the six months' period.

The safety training course for foremen opened in April and continued through May, with 177 employees representing 70 different firms present at the meetings in the Engineering Societies Building, New York City.

Dow President Cited for Industrial Contributions

NEW YORK—Warning that trying to ease out of governmental controls instead of abruptly terminating them after the war would only ease us into permanent controls that would enslave the nation, Dr. Willard H. Dow has declared that the United States must start being American and start at once.

Dr. Dow, President of The Dow Chemical Company, pioneers in the development of Magnesium in this country (The Tool Engineer, March, 1944), recently appeared before the Truman Committee in Washington and demanded to be heard on what he called "A Department of Justice Smear" that his company had been a member of a German Cartel. The Committee fully vindicated him.

Dr. Dow's remarks were in a speech delivered in acknowledgment of the American Institute of Chemists' Gold Medal award for "the outstanding man who has done the most for the chemist as a man, the chemical profession, and the translation of research into products useful in both peace and war."

"Countless millions," said Dr. Dow, "are longing for what they call security and seem willing to pay any price

for any package labeled security. The sands of man's belief in himself as a being created in the image of God are running out. Men are trying to escape today by dreaming of tomorrow."

Gear Sales Bound Upward; Work on Super Fortress

PITTSBURGH—Volume of sales for the gearing industry bounded upward in March, the American Gear Manufacturers Association reports.

The industry gain, made by concerns holding membership in the Association was 126 per cent over volume for the preceding month. This figure it was said, does not include turbine or propulsion gearing. The AGMA index figure for March, 1944, stood at 485.

Additional gearing business is expected as a result of high-production of the Army's new B-29 "Super Fortress". Boeing, builders of the big ship, have contacted the AGMA on gearing work involved in the retractable landing gear assemblies and more work on this job still is available, it has been reported.

(Continued on following page)



War production has required manufacture at tolerances and volume seldom required in peacetime. Here is the first approved photo of the famed "bomber gyro".

New and intricate designs in war materiel have demanded of American industry the attainment of tolerances seldom required in peacetime and at production volumes unprecedented in normal consumer manufacturing.

The electronic automatic pilot, which holds aircraft on a perfect course during bombing runs, is an example of such work. Here, an employee at the Minneapolis-Honeywell Regulator Company works on the gyro motor which is built to such precise tolerances that it must be oiled with one drop from a hypodermic needle.

“GREENIE”

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

Problem Girl



Answer to Greene's problem: Each side of the aluminum triangle is .770 yards long; the area is 2.31 square yards.

(Continued from preceding page)

OCR Director Attempts to Clarify Civilian Production

WASHINGTON—Planning for expansion of and conversion to essential civilian production may have received a shot in the arm here early in May when Donald Nelson, WPB Chairman, announced the appointment of a new Vice Chairman for the Office of Civilian Requirements.

Named to the OCR post was William Y. Elliott, who moves up from his old position as head of the WPB Stockpiling and Transportation Division. Elliott has been a figure in the Washington war production scene since the spring of 1940 when he left newspaper work to assist Edward R. Stettinius, Jr., in the National Defense Advisory Commission.

Having replaced an industrialist, Arthur D. Whiteside, whose impatience with the slow progress of conversion to civilian production is said to have caused his resignation, Elliott is in a

hot spot. His first official statement was carefully weighed by observers in Washington, searching for some clue to a reconversion policy that obviously will be handed down from Nelson's office.

The best indications they could find in culling Elliott's page-long statement were these remarks:

"At this stage of the war, no new civilian programs can be instituted which might jeopardize the urgent war production programs... A balanced production for the war program must obviously have the highest priority; but once this balance of the most necessary production for the war machine is assured, the next consideration must be the immediate production of more of the most needed civilian goods.

"As to who shall resume civilian production first, there will be the closest cooperation with the industry divisions, the War Manpower Commission and the Smaller War Plants Corporation. Distribution of new civilian

items coming back into production should proceed equitably through normal channels. In areas of great population shifts, sometimes new channels may have to be worked out with the trade. As soon as possible, of course, the objective is completely free enterprise, in our normal way."

Washington reporters continued to watch for the appearance of a definite civilian production program.

Bendix Salvage Program is Model for Industry

SOUTH BEND—Segregation of metals by alloy types, throughout all production stages is the key to the efficiency of a comprehensive salvage program which recovers nearly 800 tons of scrap metals per month in the Bendix Products Division of Bendix Aviation Corporation.

Chips and shavings, which are classified in six different alloys, represent the largest item in the plant's metal salvage program, according to H. F. Bundy, salvage manager. A total of more than 1,750,000 pounds of steel was salvaged last month.

Salvaged by Bendix during an average month: 100,000 pounds of cast iron; 160,000 pounds of aluminum in 11 different alloys; 35,000 pounds of magnesium in 5 alloys; and 15,000 pounds of brass in 3 alloys.

Code marked containers are used to collect and segregate metals from machines to shipping platforms.

The plant's material conservation department salvages all types of paper, gathering as much as 84 tons monthly. Obsolete drawings and blueprints containing restricted data are collected and processed under guard.

An example of Bendix ingenuity is its solution of recurrent zinc shortages. By purchasing used automotive carburetors, the plant now obtains 10,000 pounds of zinc and 5,000 pounds of aluminum per month for use in the foundry and die-casting departments.

Other items recovered monthly: 8,000 gallons of cutting oils, 16 tons of graphite, emery wheels, wood kegs and barrels, and wire and metal bindings.

Industry Reluctant to Declare Machines Idle for WPB Survey

The Tools Division of the WPB now is working on a survey of the idle machines on hand in all war plants. War production contractors, however, are reluctant to declare any piece of equipment idle unless they are certain they will have no unexpected use for it in months ahead because such equipment might be transferred elsewhere.

Success of the Board's redistribution program is spotty, with only one outstanding example of a substantial listing of idle machines. That list is on hand in the Detroit office of the Federal agency and covers tools in automotive plants in Southern Michigan and Northern Ohio.

Shifting production emphasis in war
(Continued on page 120)

A SOUND POSTWAR INDUSTRY CALLS FOR INTELLIGENT TAXATION

No segment of American industry deserves more credit than cutting tool manufacturers for the victory we have achieved on the production front. Likewise, future trends in mass production metal working are contingent on wartime and post-war developments in cutting tool design and materials. Here is another in The Tool Engineer magazine series on the post-war outlook from the viewpoint of prominent cutting tool producers.



G. E. SHEDRICK, SR.
PRESIDENT
MIDWEST TOOL
& MANUFACTURING COMPANY

FOR the past three years, the metal-cutting-tool industry has successively been faced with serious production problems, which, with a few exceptions, have now been solved. It is up to all of us to try to recognize potential postwar pitfalls and attempt to establish a more firm industrial foundation through serious thought, careful planning.

When compared to all other countries of the world, the American standard of living is much higher, and we have far outstripped other nations in production of this wealth. Perhaps more important than any other recognizable factor, this has been due to our low cost of government, which for many years prior to the war was less than five percent of the national income, as compared to an average of 30 percent for foreign nations.

With reasonably low tax rates, American industry had capital available for expansion, increased



"... as our taxes continue to grow, industrial development stagnates..."

employment, and development of new products. By the same token, as taxes continue to grow, industrial development toward better living grows increasingly stagnant. Taxes on industry deeply affect every single individual and they will be a major postwar problem.

We still face the serious job of winning the war, and not one tax dollar which will aid in reaching this goal at the earliest possible date should be held back. On the other hand, when peacetime living returns, tax expenditures for non-essentials must absolutely be eliminated so that industry will have the desire and ability to progress in the production of commodities for even higher living standards.

"The efficiency of lathes has increased so greatly we replace old types quickly. In measuring efficiency, we find L & S Lathes pay dividends first."

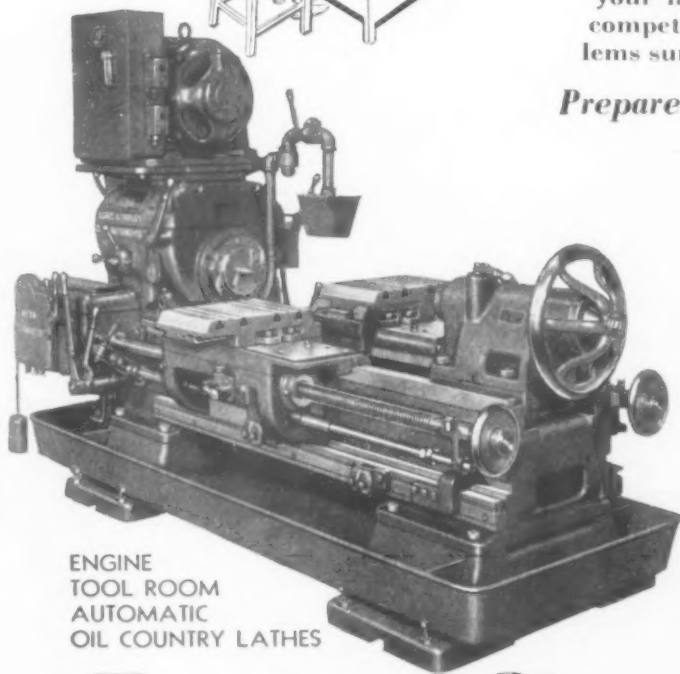


UNDER the stress of wartime production you may not have had time to thoroughly analyze the quality and quantity of lathe output in your shop. Production lathes in continuous use for several years become a liability under three shift operations, unskilled handling and increasing down-time. Add lowered output, failing accuracy, mounting costs and upset schedules—and you have a bad condition, bound to grow worse if neglected.

Check over your production sheets with Lodge & Shipley Engineers. Find out in actual dollars and cents the economies you can make by replacing old, worn lathes with new and better ones. Our experts can show you, too, how L & S "engineering foresight" will make your lathes adaptable to the new competitive and production problems sure to come.

Prepare for the Coming Battle of Markets!

When competition grows keen, new and better machine tools will be the chief factor in holding costs to a competitive level. Lodge & Shipley, with 52 years of specialized lathe experience, can give your turning operations the "short cut" to lower costs. Save later by planning now!



ENGINE
TOOL ROOM
AUTOMATIC
OIL COUNTRY LATHES

The No. 3-A Duomatic (illustrated) is a full automatic lathe permitting dual operations—front and rear—for quantity production of work. With the 3-A Duomatic any combination of turning, straight or angular "in" or "out" facing cycles are obtainable, front or rear, singly or together. Diameters and lengths are automatically controlled, insuring exact duplication of sizes. The 3-A Duomatic handles a wide variety of work in large or small quantities with equal efficiency. Write for Bulletin 601 FL for complete data.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, 25, OHIO, U. S. A.





When you change over to civilian products—here's how EUREKA Tool Steel Welding Electrodes will help you save time, material and avoid production delays.

1. You can repair existing die units to keep them in operation with a minimum of "down-time".
2. Changes can be made during die "try-out" periods by correcting design, rectifying errors, etc.
3. During die "change-over" contours, corners and edges of your old dies can be welded to adapt them to change in design.
4. Die units can be compositely fabricated by welding with desired tool steel electrodes, on mild or medium carbon steel, to form cutting edges or working areas.

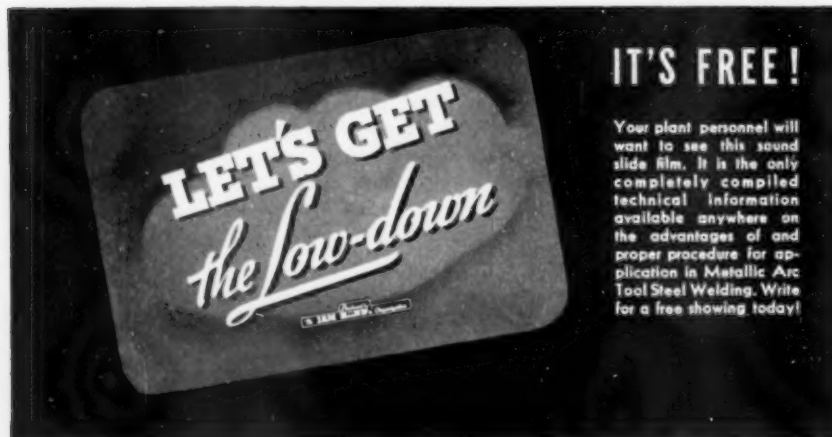
Space does not permit detailed information here—so write us today for descriptive literature.

Distributors in principal cities of U.S.A. and Canada



Welding Equipment & Supply Co.

WELDING ENGINEERS WITH A COMPLETE SERVICE
223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN



IT'S FREE!

Your plant personnel will want to see this sound slide film. It is the only completely compiled technical information available anywhere on the advantages of and proper procedure for application in Metallic Arc Tool Steel Welding. Write for a free showing today!

INDUSTRIAL NEWS DIGEST

(Continued from page 118)

industry in this area, it is said, has resulted in the declaration of some 16,000 useable machine tools.

New Entry in Machine Tool Electric Control Field

CLEVELAND—Formal entrance of another manufacturer into the machine tool electrification and electronic field assured here April 29, when Reliance Electric and Manufacturing Company previewed its motor control developments before a large audience of machine tool builders and trade press reporters.

Highlight of the "Seeing is Believing" meeting was a demonstration of a new system of electronic motor control which is not affected by temperature change. Reduced maintenance requirements was one of the advantages claimed for the Reliance equipment.

On a tour of the Company's Cleveland plant, many applications of these electronic devices were demonstrated on machines actually turning out war material. Units on which controls were installed included lathes, grinders, drills and boring machines.

C. L. Collins, President of Reliance, opened the meeting with an announcement of an electronic unit for supplying excitation of their all-electric adjustable-speed drives. Collins visualized numerous uses for this product in postwar production.

Not generally known, it is believed, is the fact that Reliance originally entered the electronic machine tool control field earlier in the war effort when the Company produced the controls for the large boring mills General Motors Fisher Body Division produced in its own Grand Rapids, Michigan, plant.

ERRATUM:

MILLING WITH FLY CUTTERS

● Ralph R. Weddell, author of "Milling With Fly Cutters", The Tool Engineer, April, 1944, has requested an opportunity to change several operating formulas presented in Figure 4, page 87.

Item 2 should read: Feed in inches per minute = depth x width of cut.

Item 3 should read: R.P.M. (approx.)
= $4 \times \text{Cutting Speed (in ft. per min.)}$
Diameter of Cutter (in inches)

—THE EDITORS

Safety Color Code Offered Industry by du Pont

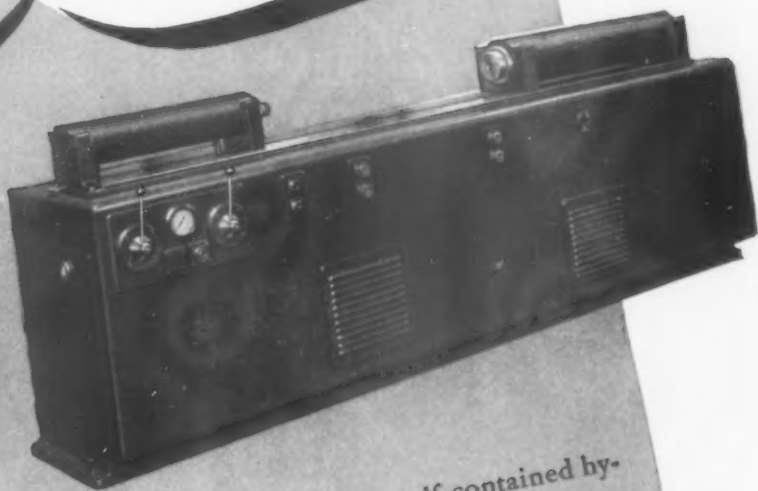
NEW YORK—As a contribution to the fight against industrial accidents, E. I. DuPont de Nemours & Company has offered a new "Safety Color Code for Industry" involving a system of colors and symbols.

Under the plan, explained by du Pont engineers at a press gathering here, six colors and six symbols would be standardized upon by all plants, just as railroad symbols have been standardized.

(Continued on page 122)

READ THIS STORY:

Learn Why The **NEW Barnes** HYDRAULIC PRESS SERVICE Offers High Production Possibilities



BARNES HYDRAULIC PRESSES ARE AVAILABLE IN VERTICAL, HORIZONTAL OR ANGULAR TYPES

There are practically no limits to the type of Barnes hydraulic presses available to you within the capacity of 100 tons. They are constructed in vertical, horizontal or angular types to suit your job specifications. Our engineering and manufacturing facilities are geared to meet your special requirements, whether the job calls for a vertical, horizontal or angular type press.

BARNES TIME TESTED HYDRAULIC FEATURES ASSURE HIGHLY SATISFACTORY OPERATION

The same pumps, valves, and other basically standard hydraulic elements used in our self-contained hydraulic circuits are used on our hydraulic presses, giving you ample assurance of highly satisfactory results. With Barnes equipment both the hydraulic circuit and the machine are supplied from the same source, guaranteeing you a more complete, well integrated working combination and placing responsibility for successful operation directly on one manufacturer.

In addition to our line of unit type self-contained hydraulic circuits we now offer engineering and manufacturing service in hydraulic presses. These are not in the experimental stages. They have been tried and tested and have proven extremely valuable and productive to the many organizations now employing them.

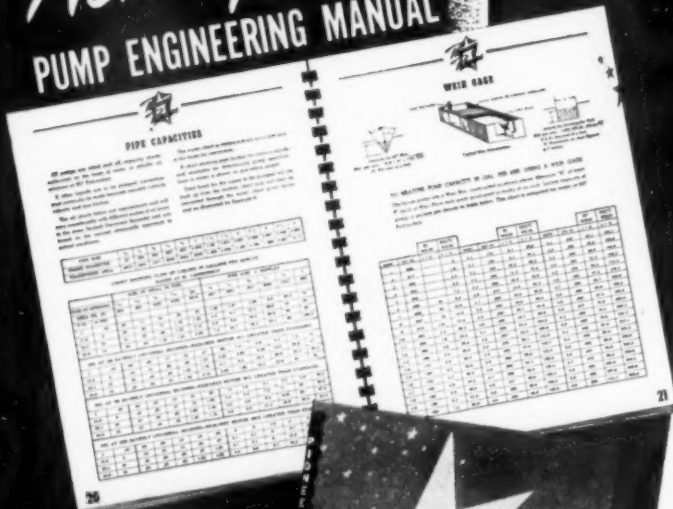
Barnes hydraulic presses incorporate all of the design and construction features that have made Barnes Self-Contained Hydraulic Circuits so long effective and productive in their various machining applications. Foremost among these are — automatic pressure control, utilizing the Barnes 2 volume system which assures the necessary volume of oil for the pre-determined ram speed — easily accessible adjustment of ram tonnage — remote control features available from the hydraulic circuit which is built integral with the press structure. In addition their compact design makes parts readily accessible for inspection and adjustment. They are extremely compact and require a minimum of floor space.

BARNES ENGINEERING SERVICE

If you have a press problem requiring capacity up to 100 tons submit it to our engineers for a preliminary analysis. This service will not obligate you in any way and may result in a profitable solution to your requirements. Please send complete details of the job together with part print if possible.

John S. Barnes Corporation ROCKFORD, ILLINOIS

Yours for the Asking! VALUABLE PUMP ENGINEERING MANUAL



88 PAGES OF
CONCISE PUMP AND
PIPE DATA AND
PRACTICAL HELPS
write
FOR YOUR COPY!

This valuable COOLANT PUMP ENGINEERING MANUAL is a practical reference book that answers many questions. It contains examples of pump application with typical methods of installation. It shows how to compute adequate coolant flow for various machine operations and carries several pages of valuable pipe capacity charts. The MANUAL is crammed with the type of useful information you'll want to keep handy. Order your copy today. Just write on your company letterhead and give your title for the PIONEER PUMP ENGINEERING MANUAL. We'll rush it to you...and of course, there's not the slightest obligation.

Supply
Limited
GET YOUR COPY
Now!



Pioneer Pump & Manufacturing Co.
19645 JOHN R ST. • DETROIT 3, MICHIGAN

INDUSTRIAL NEWS DIGEST

(Continued from page 120)

The colors recommended are "high-visibility yellow" for marking stumbling, tripping or falling hazards; "alert orange" for identifying cutting or crushing dangers; "safety green" for safety equipment, except fire extinguishers which are painted "fire protection red"; "precaution blue" indicating operating machines and equipment shut down for repairs. The last symbol, "traffic white", would mark aisles, storage areas and rubbish containers.

As each symbol would be distinctive in shape, marked on the wall above and the floor below the hazard, they could be identified by workers afflicted with color-blindness.

The symbol system, offered by du Pont to industry, already has been used with highly satisfactory results in a number of plants.

AIRCRAFT PRODUCTION

Budd in Full Production on Stainless Steel Plane

PHILADELPHIA—Edward G. Budd, pioneer user of stainless steel in transportation equipment, made aviation history here with announcement of full-scale production of a huge stainless steel cargo plane for the Navy.

Known as the Conestoga, the super-cargo ship is a new type utilizing welded steel in place of conventional aluminum alloy. Sixty-eight feet long, with a wingspread of 100 feet, the two-engine transport is capable of carrying 10,400 pounds of cargo 650 miles in one jump.

The freight compartment, which is 25 feet long and eight feet square, is unobstructed by girders. A door beneath a high tail structure permits entry of several automotive units into the cargo hold.

Budd's "flying box car" was developed by company engineers under Navy sponsorship.

Scheduled production of some 900 such ships should give Budd good experience on a "postwar product".

SPECTACULAR RIVETING

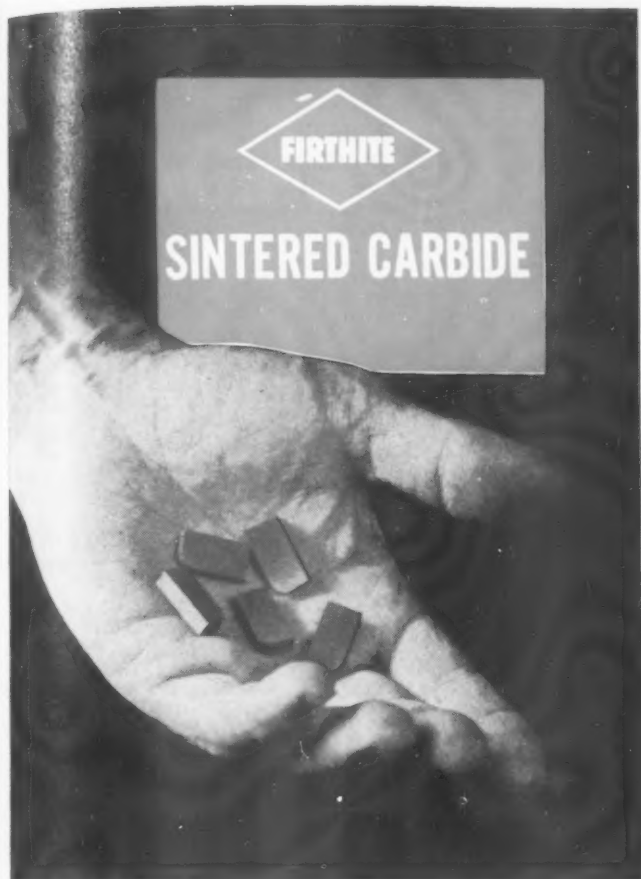
● Invention of a new machine designed to set 33,600 to 75,000 rivets an hour, compared with a normal 350 an hour, has been disclosed by Lockheed Aircraft Corporation.

The spectacular machine, according to its inventor, Reidar Olsen, Lockheed manufacturing engineer, punches and sets rivets in a continuous operation and is adaptable to any surface of aircraft.

Three men in six minutes can perform work normally requiring 100 manhours, Olsen said.

(Continued on page 124)

THE TOOL ENGINEER



THERE ARE PLACES FOR BOTH . . .

Firth-Sterling, long specialists in making steels for shop tooling, early recognized the possibilities of carbides as a means of extending the improvement in shop practice brought about by the super high-speed steel—CIRCLE C. **But, there is a place for both . . .**

Where the highest speeds are obtainable or materials are hardest, FIRTHITE is the "last word" in a cutting material. It is used at speeds up to ten times those possible with high-speed steels. Where speeds above average are permissible or materials are "on the hard side," CIRCLE C will cut *at least 25%* faster than ordinary grades of high-speed steel. Send for descriptive literature on these remarkable materials.

For instance:

FIRTHITE removes 730 pounds of gray-iron casting metal per hour instead of 180 pounds;

drills a gun barrel in 23 minutes instead of 1 hour;

enables milling-cutters to run at 1,000 feet per minute instead of 100 feet with previous materials.

For instance:

CIRCLE C machines hard die blocks in 28 hours instead of 42 hours . . . doubling production between grinds—versus regular high-speed steel;

turns two to ten times more pieces of heat-treated alloy steel between grinds than other high-speed steels.

Firth-Sterling
STEEL COMPANY



Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

MATERIALS

**New Director Named
for WPB Steel Division**

WASHINGTON—Following the resignation of John T. Whiting, Norman W. Foy has been named Director of the War Production Board's Steel Division.

Whiting will return to his post as President of the Alan Wood Steel Company, according to Charles E. Wilson, WPB Executive Vice Chairman, who pointed out that Whiting had long overstaid the time he had originally agreed to spend on WPB work.

Foy, who was advanced from the position of Deputy Director, came to WPB from Cleveland.

**SAFETY RECORD: 350 YEARS
WITHOUT A FATALITY**

● SCHENECTADY — Safety records of more than two hundred million man-hours of work without a fatality deserve recognition. Such records, believed unequalled in any heavy apparatus manufacturing factory in the country, have been established by two of General Electric's big plants.

Since the last fatality in the G. E. Schenectady Works, more than two years ago, the plant has worked 211,124,832 man-hours. Close to this record is the Fort Wayne, Indiana, Works with 200,272,098 man-hours since its last fatality.

"If the Schenectady Works' record were applied to an average plant of 250 employees, this would mean 350 years without a fatality," Company Safety Engineer George E. Sanford explained.

**Plastic Industry Leader
Views Postwar Outlook**

CINCINNATI—What is the postwar role plastics will play in mass production of consumer products? One of nation's leading plastic manufacturers and fabricators last month shattered the pipe dreams of those who are creating a new "plastic age" with the help of typewriters and drawing boards.

Throwing away his rose colored glasses, D. J. O'Connor, President of The Formica Insulation Company, manufacturers of laminated plastics, stated that he "does not believe that plastic products are going to revolutionize all industry and replace all other materials".

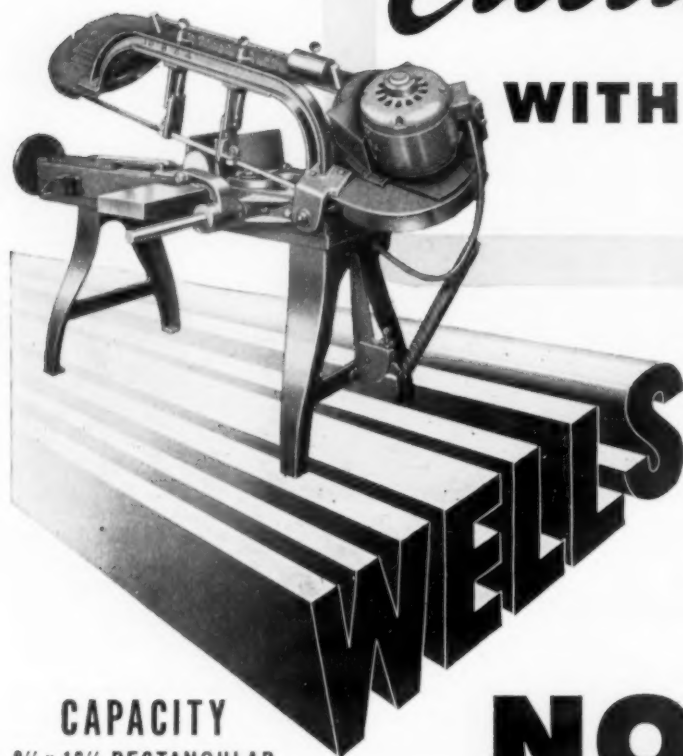
While noting that the war has been the occasion for development in the plastics industry enhancing its growth several times its former size with improvements, new compounds and synthetics, this plastics industry leader said his company has been "realistic in preparing for our postwar approach to the expected markets".

(Continued on page 126)

PRODUCTION

Cutting

WITH A



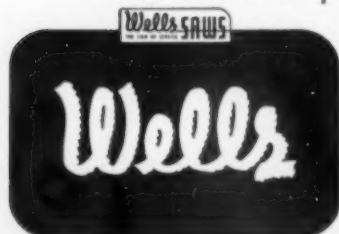
CAPACITY

8" x 16" RECTANGULAR
8" DIAMETER, ROUND

NO. 8

To maintain metal cut-off PRODUCTION on demand output, and make your QUOTA PLUS . . . To hasten maintenance and repair work, and ELIMINATE COSTLY DELAYS on imperative production . . . Put a WELLS No. 8 to work . . . Built rigid and sturdy, it's portable, too . . . Move a Wells Saw to the job and SAVE time, SAVE money.

Write for descriptive bulletin on WELLS SAWS.

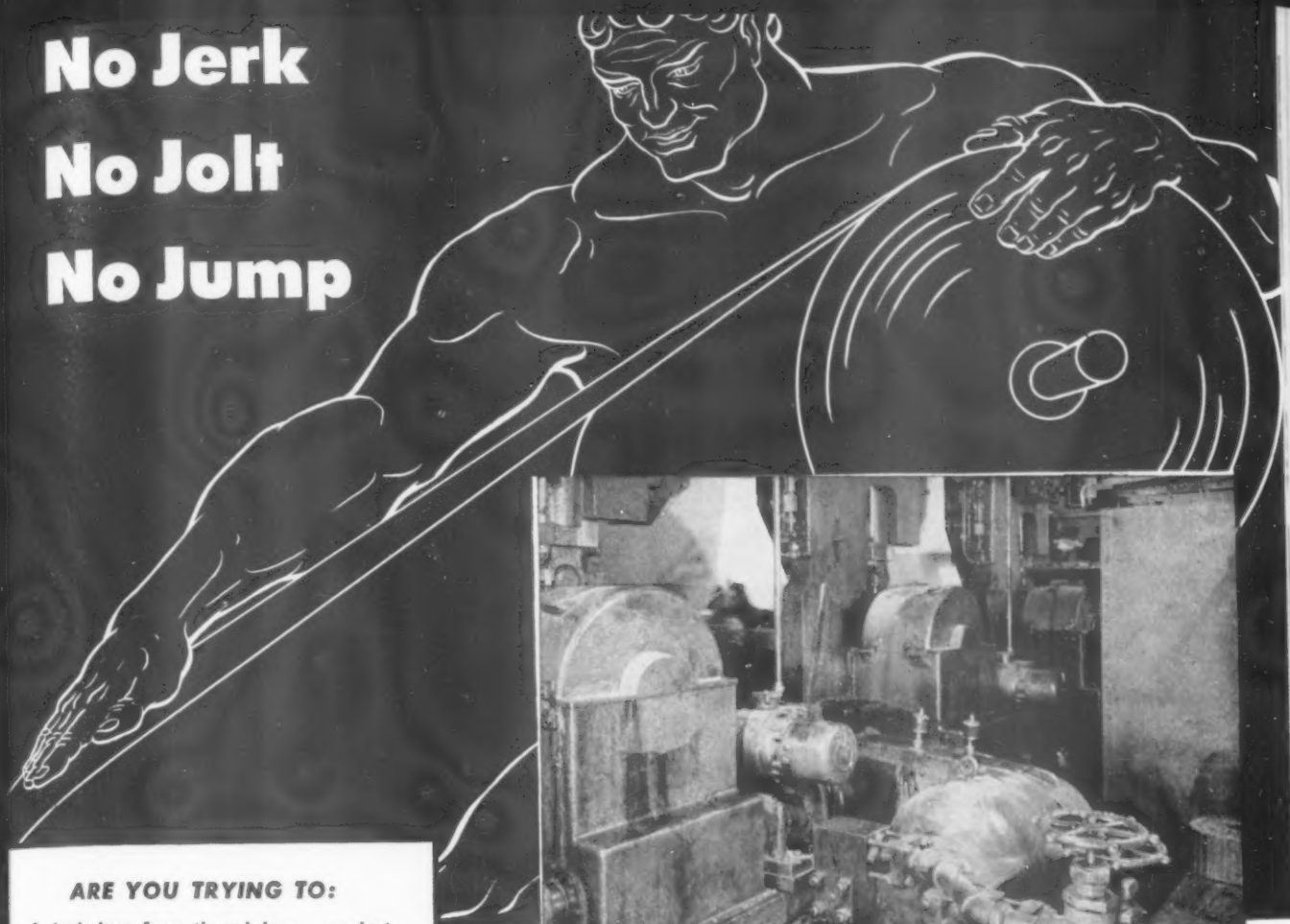


Products by Wells are Practical

**METAL CUTTING
BAND SAWS**

WELLS MANUFACTURING CORPORATION
1212 MONROE ST., THREE RIVERS, MICHIGAN

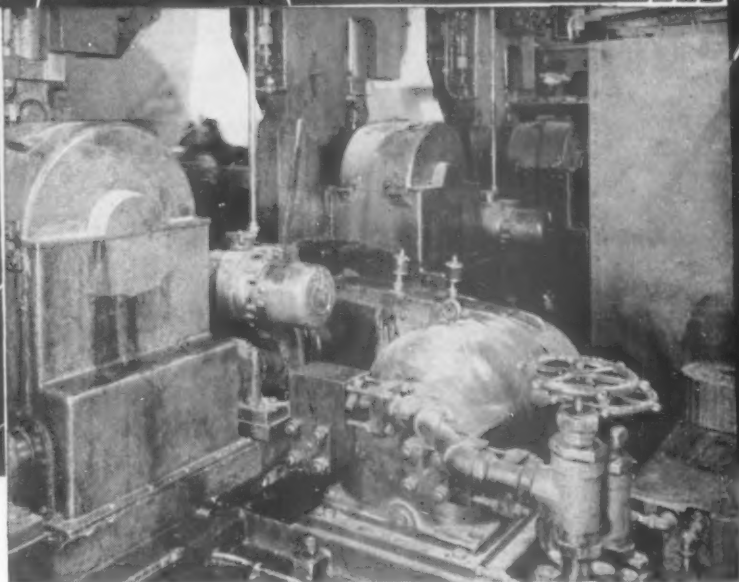
**No Jerk
No Jolt
No Jump**



ARE YOU TRYING TO:

1. Apply large forces through long ... or short ... strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction ... with or without pre-set time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light ... or heavy ... forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!



An Oilgear Plus: Oilgear also enabled Neo Gravure to discover for the first time the correct pressure to use on their impression cylinders. Result: longer sustained quality, longer roller and cylinder life.

The Famed Oilgear "Glide" May Solve a Drive Problem for You

To print an entire magazine in 4 colors, on both sides of the paper, in one pass through a huge rotary press requires an unbelievable miracle of smoothness and synchronization. But the Neo Gravure Printing Company of New York and Chicago weren't getting the miracle. They got spoilage, waste and delay instead. So they turned, as many another company or machine designer in trouble has turned, to Oilgear Fluid Power. That was in 1934, then 1936, then 1937 and 1939. For they found that Oilgear accelerated their presses as "smooth as silk" from zero speed to maximum ... synchronized all press units in lock-step ... gave a new precision control, hundreds of feet more

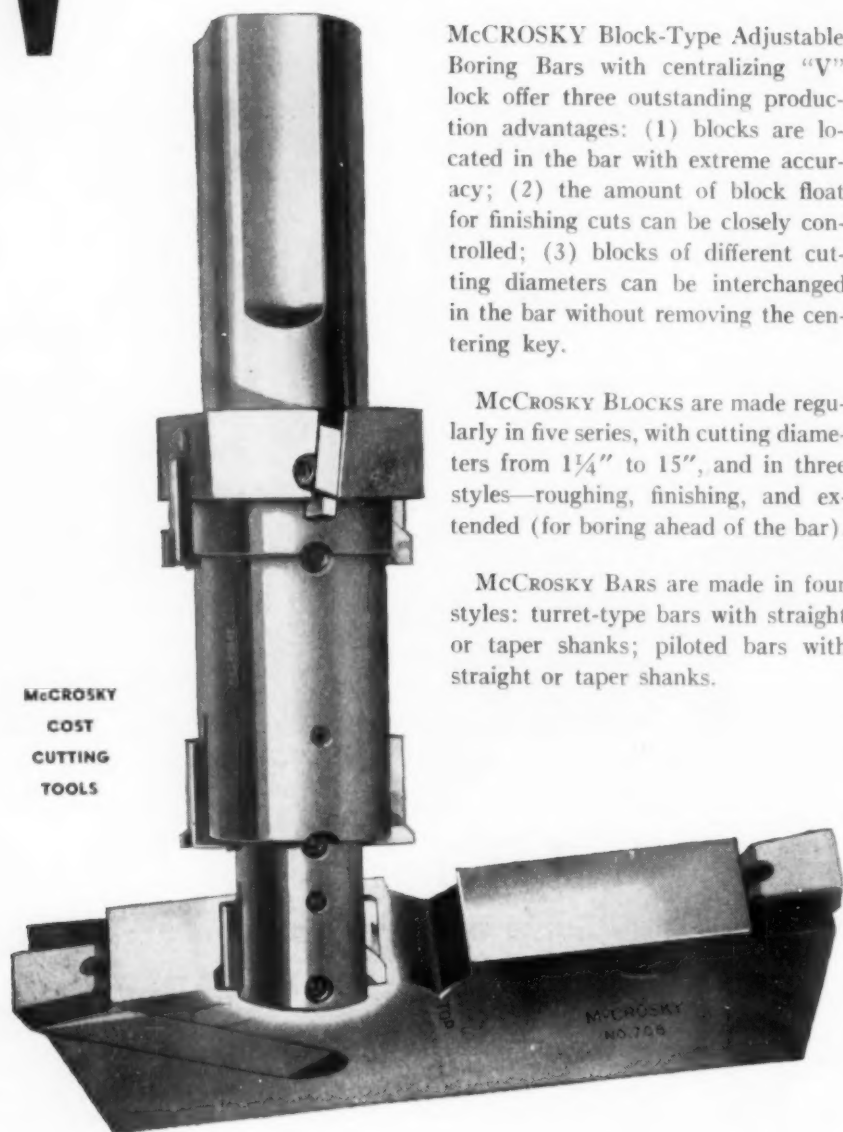
floor space, and a performance which became a new standard for the industry.

The famed Oilgear stepless acceleration is just one of the dozens of remarkable functions this remarkable system can bring to your machine design problem. Maybe you want tremendous power in small space ... power around corners where belts and gears can't reach ... a combination of rotary and linear motion. Maybe you need something you haven't thought of. Why don't you consult Oilgear engineers' broad experience and see what Oilgear versatility can do. Now is the time to write. ... **THE OILGEAR COMPANY, 1308 Bruce Street, Milwaukee 4, Wisconsin.**

OILGEAR

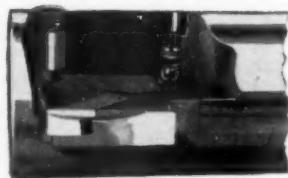
Fluid Power

McCROSKY block-type adjustable BORING BARS with centralizing V - LOCK FOR ACCURACY



HOW BLOCK IS CENTERED AND LOCKED IN BAR.

Middle section of centering key is a tapered "V" engaging a complementary "V" in block. Advancing headless screw at top of key brings key into firm contact with "V" of cutter block. Retracting of screw allows block to float.



McCROSKY Block-Type Adjustable Boring Bars with centralizing "V" lock offer three outstanding production advantages: (1) blocks are located in the bar with extreme accuracy; (2) the amount of block float for finishing cuts can be closely controlled; (3) blocks of different cutting diameters can be interchanged in the bar without removing the centering key.

McCROSKY BLOCKS are made regularly in five series, with cutting diameters from 1 1/4" to 15", and in three styles—roughing, finishing, and extended (for boring ahead of the bar).

McCROSKY BARS are made in four styles: turret-type bars with straight or taper shanks; piloted bars with straight or taper shanks.

For complete details ask for McCrosky Bulletin 16-B and the McCrosky Boring Bar Manual. Write to McCrosky, Meadville, Pa.

M

McCROSKY TOOL CORPORATION

INDUSTRIAL NEWS DIGEST (Continued from page 124)

Speaking before a gathering of 1,000 Cincinnati business leaders attending a first showing of "The Formica Story", film chronicle of the plastics industry prepared by his company, O'Connor declared these new materials "are going to be used only where they fulfill requirements:

"To do the job as well or better than any other material, and—

"Where they do it at a cost equal to or lower than the material replaced."

O'Connor stated that "we do not expect to see automobile bodies and airplane fuselages made from plastics, but we do expect to see large quantities of laminated plastics used in the interiors of automobiles, buses, Pullman cars and similar uses."

Fields where laminated plastics have had "successfully accomplished applications" and which this 30-year-old fabricator considers prime for postwar markets were listed as follows:

1. Electrical and mechanical applications in the automotive industry.
2. Electric power producing and distributing equipment.
3. Domestic electrical equipment including refrigeration.
4. Radio and television.
5. Chemical equipment industry, such as plating equipment and non-corrosive parts.
6. X-Ray and therapeutic apparatus.
7. Textile equipment, especially upon producing machinery.
8. Rapidly growing architectural and decorative applications, including furniture, household fixtures, doors, store fixtures, hotel furniture, soda fountains and similar applications.

Business-wise O'Connor, who knows that a good thing can be oversold, told his audience, "If the industry makes as much progress in the next 30 years as it has in the past, it will then represent a very sizable production."

Research Engineer Reveals Causes of Metal Rusting

MILWAUKEE—Vacant spaces in the atoms of nickel are responsible for its resistance to corrosion of "rusting", Dr. Herbert H. Uhlig, Metallurgist of the General Electric Research Laboratory, told the Electro-Chemical Society meeting here recently.

In earlier researches of interest to fabricators of metal products, Dr. Uhlig found that the "stainlessness" of stainless steel is not due primarily to the formation on the surface of a film of oxide, as formerly supposed. Instead, he said, it results from the electronic arrangement in the atoms of the alloy.

Now, he finds that the same thing is true for two other widely used corrosion-resistant alloys. One is copper and nickel (Monel) and the other molybdenum, nickel and iron (Hastelloy).

Vast quantities of valuable metals are lost annually by corrosion, the G. E. metallurgist pointed out. Such studies are important because they may reveal way of overcoming it.

(Continued on page 128)

When life hangs by a hair...



We want YOU to know that the Life of your Brother, Son or Sweetheart will not be endangered because an over or under-sized shell caused the gun which is defending him to fail.

In battle, the lives of not only a gun crew, but of hundreds of other fighting men, may depend on the unfaltering efficiency of ONE artillery piece.

Hair-breadth accuracy in the gaging of Cartridge Cases is demanded by your Army and Navy, to

make certain that all guns will be in there slugging it out with the enemy.

We are proud to have been selected by the Armed Forces to share the important responsibility of producing the gages which provide this assurance.

This same unfailing accuracy is found in ALL "Quality" Precision Inspection Gages, assuring the utmost in dependable gaging NOW and in the years of Peace.

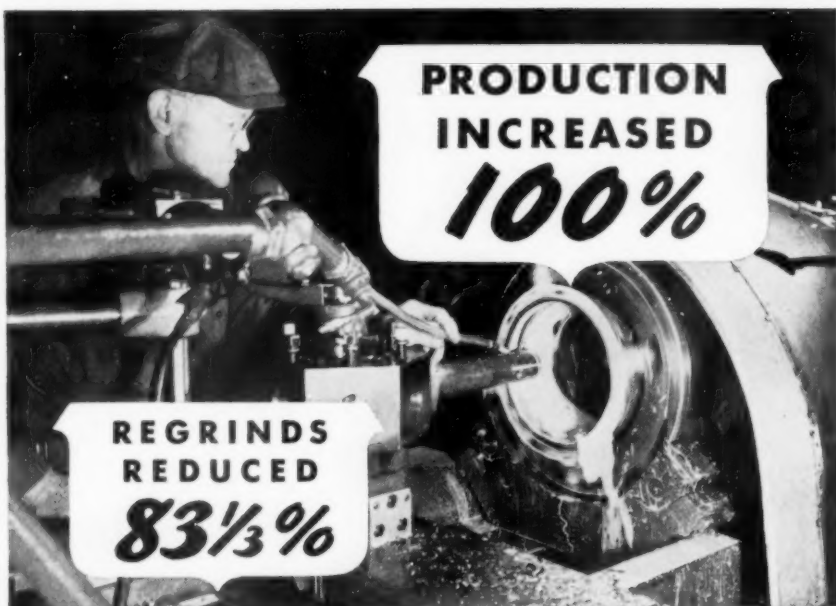
★ ★ Buy More War Bonds ★ ★

QUALITY TOOL & DIE CO.

Manufacturers of "Quality" Products

401-15 NORTH NOBLE STREET, INDIANAPOLIS, INDIANA





"HARDSTEEL" TOOL BITS

Outperformed all other tools on this difficult machining job

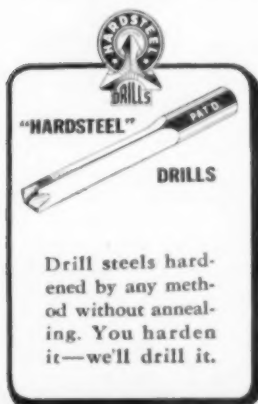
Many plants have reported the outstanding performance of "HARDSTEEL" tool bits—the following is typical.

Production of aerial torpedo tail cones from SAE 3150 steel forgings bored on a 96-inch lathe running at 126 ft. per minute and taking a .250 in. cut at .012 in. per rev. feed was three a day. Seven cuts were required,—with 3 regrinds per piece, using a high grade tool.

After changing to "HARDSTEEL" tool bits the feed was doubled to .025 in. per rev.—regrinds were cut to 3 per day and output increased to six tail cones per day.

"HARDSTEEL" tool bits are cast from a special alloy, the same material that enables "HARDSTEEL" drills to drill hardened steels without annealing. They are economical on tough, hard steels, scale covered forgings and the tough, abrasive copper and light metal alloys.

Let "HARDSTEEL" help you turn out more work at lower cost. Outline your tool problems—or ask for a copy of the "HARDSTEEL" Operators Manual.



BLACK DRILL COMPANY Division of BLACK INDUSTRIES

1400 East 222nd Street • Cleveland 17, Ohio

"HARDSTEEL"
DRILLS • TOOL BITS • SPECIAL TOOLS

INDUSTRIAL NEWS DIGEST (Continued from page 128)

INDUSTRIAL BUSINESS NOTES

News of Industry Expansions, Services and Activities

Expansion: Vickers, Incorporated, announces establishment of a new West Coast test and service center at Beverly Hills, California. The added facilities augment the company's established sales engineering organization in the Los Angeles area.

Objective of the new setup is to circumvent the need of returning the company's hydraulic products to Detroit for inspection, repair, and testing.

Appointment: * Tool Engineering Service, Birmingham, Alabama, has been named representative for the Cleveland Automatic Machine Company in the southern states. The agency will handle sales and service for the complete line of Cleveland Automatic machines. Harry D. Frueauff is president of the Birmingham concern.

Representatives: * Walter F. Greene and the Don Hall Tool Company have been named representatives of the Lovejoy Tool Company, according to the latter firm. Greene will serve the Indianapolis territory, and the Hall organization will handle the Chicago district.

Eastbound: * Allen-Bradley Company, formerly of Milwaukee, has moved to New York City. C. N. Caulkins remains in charge as New York district manager. The company manufactures electrical controlling equipment.

Re-election: * Directors of the National Tool Company have retained in office all incumbent officers. Those re-elected include Arthur J. Brandt, president; Samuel J. Kornhauser, executive vice-president and secretary; Lewis F. Jubenville, vice-president; Lionel A. Schmidt, vice-president and chief engineer, and Anton Erhardt, plant superintendent.

Purchase: * Yale & Towne Manufacturing Company has announced the purchase of the scale business of the Kron Company, Bridgeport, Connecticut.

No changes in the Kron line other than those dictated by the needs of industry are contemplated, it was stated. Kron facilities and personnel, together with the sales and service organization, will be retained at Bridgeport, with general supervision under the Philadelphia Division of Yale & Towne.

Branch: * Climax Molybdenum Company has opened a new branch office at Detroit to handle sales and service work for the Michigan, Indiana, and Toledo districts.

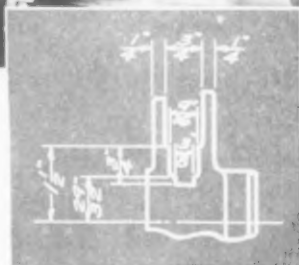
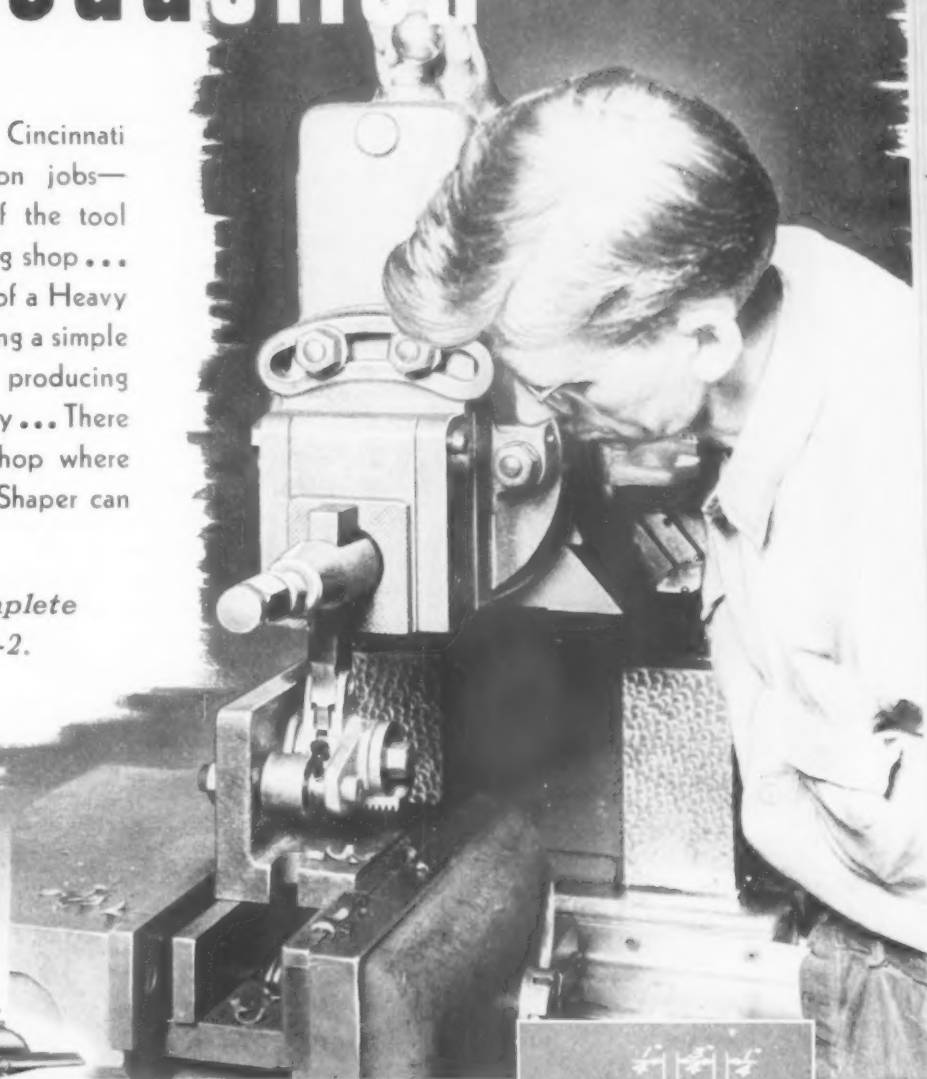
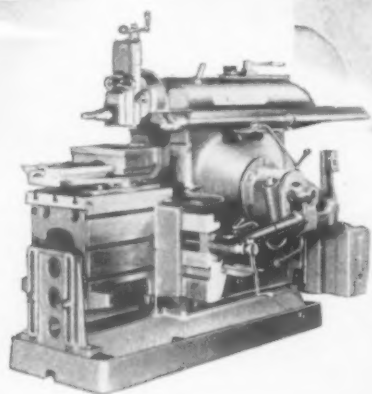
V. A. Crosby, metallurgist and sales representative for the company for the past 10 years, will be in charge. W. G. Patton also will work at the office and will have charge of compilation and publication of technical data on molybdenum steels and irons.

(Continued on page 130)

Production

A surprising number of Cincinnati Shapers are on production jobs—they have stepped out of the tool room into the manufacturing shop... Here is a typical example of a Heavy Duty Cincinnati Shaper, using a simple fixture and forming tool, producing with economy and efficiency... There may be a spot in your shop where a Heavy Duty Cincinnati Shaper can be used with profit.

*Write for our complete
Catalog No. N-2.*



THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES



Tannewitz DI-SAWS

*and You'll Want
No Other!*

A broad statement? Yes. But soundly founded on facts—the experience of numerous large manufacturers — the actual performance records of the machines, themselves — and fundamental superiorities of design and construction.

Larger wheels (24" diameter on the standard models) provide greater traction, faster, straighter cutting, more production. Transmissions, common source of die saw grief, never fail in TANNEWITZ DI-SAWS.

**STANDARD MODEL No. M24
(24" WHEELS)**

Sturdier, heavier construction throughout, plus many refinements of design, make these machines the greatest, trouble-free producers in their field. It pays to buy the best!

With a TANNEWITZ DI-SAW you can do in minutes jobs which require hours by the shaper, miller or lathe methods.

Get the complete facts. Just write for DI-SAW bulletin.

Other Models to Handle Work of Practically Any Size

Made with 30", 36", 48" and even larger throat capacities if desired, the TANNEWITZ "Big Bertha" models make available the tremendous savings of inside and outside sawing, filing and polishing on dies, jigs and other work of practically any size. Write for bulletin.

On request: Bulletins on Single and Variable Speed Foundry Band Saws; Sheet Metal Cutting Band Saws.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

INDUSTRIAL NEWS DIGEST

(Continued from page 128)

Research work will continue under the direction of A. J. Herzig, vice-president and chief metallurgist.

Research: Presaging significant developments in research on gas turbine engineering, creation of a new research and gas turbine development division has been announced by Allis-Chalmers.

The company already has a toehold in the field, having built several gas turbine units for oil refineries. Also, Allis-Chalmers in currently building an aircraft supercharger version of the gas turbine, is enlarging its experience for future developments.

Takeover: Western Electric Company has added 87,000 square feet of manufacturing space to its wire and wire-products facilities by the possession of the Defense Plant Corporation's plant at Scranton, Pennsylvania. Acquisition of the plant was attained through agreement with the DPC and

NEEDED: MORE FLOOR SPACE

● Despite retrenchments in over-all plant construction and production cut-back threats, many individual producers of war materials still are expanding shop facilities.

But the period has passed when industry says, "Let's throw another wing on the plant." Today, producers are out hunting structures convertible for duration-use.

Examples: For more space in which to boost electrical cable output, Habirshaw Cable Wire Corporation is leasing Westchester County's \$1,000,000 recreational center, White Plains, New York.

Up in St. Paul, A. O. Smith Corporation has stepped up production of steel aircraft propeller blades in the livestock building at the Minnesota state fair grounds.

will permit transfer of part of the wire manufacturing operations from the company's Baltimore works, which will take on additional production for the armed forces.

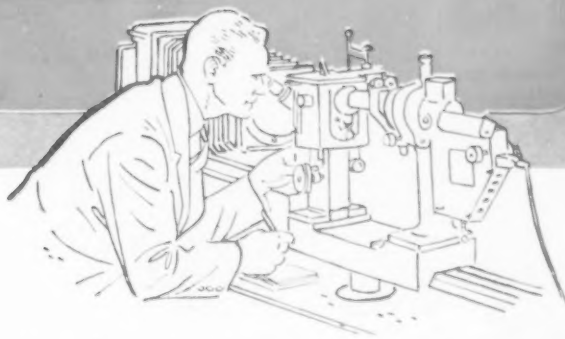
As soon as the Scranton plant, formerly devoted to manufacture of piston rings, can be cleared, training of employees will begin. Employment is expected to reach 1,000 persons, mostly women. J. R. Shea has been appointed works manager.

Addition: Of a new service branch in the midwest and enlargement of two existing sales and service offices in the east, has been announced by Detrex Corporation.

Charles M. Munns is in charge of the new Indianapolis branch office serving the Indiana territory. New location of the New York office is the Empire State Building under the supervision of Stanley A. Harris. The Philadelphia office has been moved to 12 South Twelfth Street, headed by Wayne Gaddy, Philadelphia Division manager.

(Continued on page 132)

Exact KNOWLEDGE



THE Advance Die and Tool Company . . . committed to the building of best Sheet Metal Stamping Dies . . . determined to acquire *exact knowledge* of die making steels and alloys.

An extensive series of laboratory tests were conducted to scientifically determine those die making materials which—

Provide Longest Tool Life Eliminate "Galling" or "Pick-Up"

During these tests, varying heat treating procedures were observed, providing the information necessary to heat treat die materials to the peak of their effectiveness.

Extraordinary performances of hundreds of Advance Dies in the nation's War Production Program attest to the value of *exact knowledge*. A single instance in which Advance punches were used for drawing steel cartridge cases is typical.

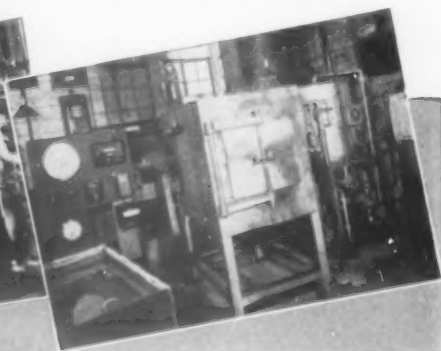
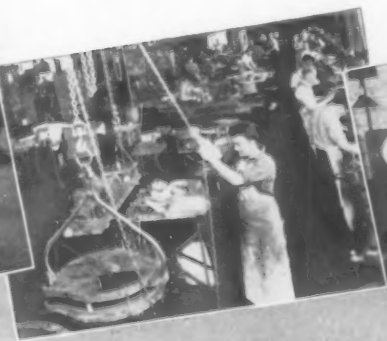
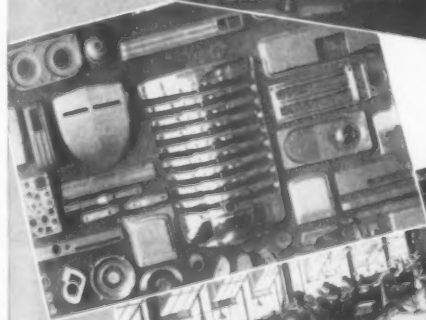
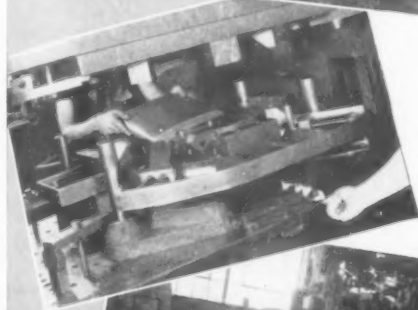
The operation required punches of great strength, freedom from galling and resistance to abrasion. Advance punches consistently produced 300% to 400% more cases than any other punches tried.

Advance Die and Tool Company are using its design and manufacturing facilities in the war effort for the duration . . . but, when peace comes, plan to use Advance *exact knowledge* in building your sheet metal stamping tools and dies.

ADVANCE DIE & TOOL CO.

6800 MADISON AVE.

CLEVELAND, OHIO



MOTOR MEMOS

Industry plans parts manufacture; Must get WPB approval on new machines. Auto shops ripe with news.



DETROIT — Dominating all news from the motor capital is the most serious slowdown and shutdown of production, the automobile industry has suffered since the "sit down period."

Details of the trouble, caused by refusal of management to recognize a foreman's union, are well known to every newspaper reader in the country.

Except for Ford, which readily acceded to the demands of its supervisory personnel, the auto manufacturers are united in an effort to resist recognition of the Foreman's Association of America. Work stoppage in war plants resulted chiefly from failure of the Armed Forces to approve material produced without foremen's supervision of inspection. Both Army and Navy have announced that product quality fell below acceptance standards after the foremen left their jobs.

Though the foremen have returned to work as a result of a dramatic appeal from Washington by the armed forces, the basic issues remain unsettled.

Of broader interest to production men is the steadfast refusal of the WPB to approve any re-tooling for automobile production. The builders, however, are driving a wedge into the government bulwark with insistent appeals to set up production lines for manufacture of replacement parts.

Packard's colorful George T. Christopher led the way a few days ago with an obviously premature announcement that his company would soon commence such work. Having licked the problem of finding space for such production in its Detroit factory, whose walls already are bulging with the big Rolls Royce engine job, Packard ran smack into the machine tool problem. The details make a good case history of what may happen to any producer who attempts now to get back into some kind of civilian output.

The WPB lacks authority to prevent a manufacturer from re-installing his own machinery, but it can refuse him materials to use on those machines. Packard has neither the machines nor materials. To make the factory space available, it has farmed out \$275,000, 000 in contracts among 139 subcontractors and is prepared to subcontract at least another \$100,000,000 worth.

Packard's petition to the WPB calls for nearly \$500,000 in equipment. Since the company will not use these machines for war production, the WPB cannot give it a priority. The original Packard equipment has been dismantled, moved into the general industry machine tool pool or distributed to other producers of war material. If the government will approve its petition, Packard says, it will take its chances on having its machine tool orders filled when builders can get around to the job.

Despite these troubles, even optimistic Christopher believes he can get parts manufacture under way soon. The Packard case is more significant than appears on first consideration, for it may be the signal for a united automobile industry demand to resume parts production. Reasons which the industry will offer for such permission are: (1) The nation's transportation system is slowing down seriously for want of spare auto parts; and (2) such limited reconversion will cut drastically the employment-lag which is inevitable during the reconversion period.

With another WPB-industry huddle on reconversion scheduled for next month, individual concerns have been busy completing the retooling estimates Washington requested they submit at a second meeting.

Such engineering department work, already well under way when the motor moguls visited Washington April 17, now are virtually completed by every

one of the major producers.

Lists of needed machine tools have been handed vendors by some customers and the machine tool builders are waiting for the government green light. (For news of General Motors' machine tool requirements, see page 109.)

The auto industry is ripe with production news. Here are the highlights at press time:

Pontiac: WPB has announced the approval of a \$521,760 facility contract with GM's Pontiac Division to alter and rearrange buildings to adapt them for assembling buses.

The Division recently was authorized to assemble 600 inter-city buses which will be built by the GM Truck and Coach Division.

Dodge: This Chrysler Division really made news with the commencement of limited production, under government order, of new commercial trucks.

Three models in production are a 1½-ton conventional, 1½-ton cab-over-engine, and a 2-ton conventional, with a choice of two wheel bases in the 1½-ton conventional model. All three models are being produced in chassis and cab, and a 12-foot stake body is being built for the 1½-ton unit with a 160-inch wheel base.

Improvements contemplated before Dodge truck production stopped in 1942 are incorporated in the new trucks. These changes include heavier transmissions, universal joint, and propeller shaft; increased braking area; the addition of several engine accessories as standard equipment; changed position of the steering column to provide more room in the cab.

Chrysler: In Chicago, the corporation announced with Army approval that the big Dodge plant there now is producing Wright 2200 horsepower engines for the B-29 Super Fortress. Employment at the Windy City factory has passed the 23,000 mark.

Hudson: Navy censorship finally permitted announcement that Hudson is producing the complicated folding wings for an improved and more powerful Curtiss Helldiver dive bomber.

The concern's mile-long wing line in Detroit, which had been used in building old-type Helldiver wings for more than two years, swung into the manufacture of the heavier wing without interruption in production.

Ford: From Dearborn came news of a 45 per cent increase in production of Pratt & Whitney 2000-horsepower aircraft engines during the last three months. Announced reason for this tremendous production gain was "perfection of manufacturing methods to meet the Army's requirements."

Cost cutting and production achievements have been made in another phase of Ford war production. Eighteen months ago the company began building General Electric-designed aircraft turbo-superchargers. Then, the cost was three and one half times greater than today.

(Concluded on page 134)



Conveyerized Packaging at Willys-Overland

More than 1,500,000 spare "Jeep" parts pass weekly along this 300-foot belt conveyer in the Willys-Overland Toledo plant.

On the line parts are prepared for shipment overseas. Willys says its new packaging methods have tripled shipments, cut costs 20 per cent.

Before packaging, parts are treated with rust preventive oil through an automatic system handling 40 tons an hour.

SPECIAL CUTTING TOOLS

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For precision carbide or hi-speed cutting tools
that are setting new standards in performance
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(Concluded from page 132)

Obviously, this reduction has been made possible by the introduction of improved methods of fabrication.

Ford-built superchargers are used on Liberators built at Willow Run, as well as on Flying Fortresses. Engineers for the pioneer motor car builder have made several important contributions toward the design of the present supercharger. Particularly outstanding has been the compressor box. As originally designed, this important supercharger part was made from cast aluminum. At government request, Ford engineers designed a box of comparable quality and weight using low-carbon steel.

It consists almost entirely of stampings, pressed out on the same machine formerly used for auto bodies. These are spot and seam-welded into a compact assembly.

Another improvement was the substitution of electric butt end welding in place of the three bolts formerly used to fasten the bucket wheel to the supercharger shaft. Tests show the welded job is stronger as well as lighter.

Electric arc-welding equipment used in this operation formerly was used on car and truck production.

Buick: The grey iron foundry of GM's Buick Motor Division will shortly be placed in operation to manufacture cylinder block and cylinder head castings for army truck engines.

Castings will go to Hercules Motors

Corporation. Other contracts are expected to further boost requirements of the Buick foundry, much of which had been converted for aluminum alloying, forging and other operations in connection with Pratt & Whitney aircraft engine production.

DeSoto: Detroit is participating in the booming production program on the new Boeing Super Fortress for the Army. Engaged until September in manufacture of nose and center fuselage sections for the B-26 bomber, the De Soto Division of Chrysler now is turn-

ing out sizable quantities of important sections of the new giant-bomber.

The auto builder is one of several hundred concerns now at work on sub-contracts for B-29 assemblies. Both the Plymouth and Dodge Divisions of the Chrysler Corporation also are producing parts for the new plane.

Fisher Body: As at DeSoto, volume production of major parts and assemblies for the Army's B-29 bomber has been attained by General Motors' Fisher Body Division.

By utilizing facilities in eight of its 16 armament producing plants, the company's output of these assemblies and parts is said to be running ahead of schedule.

Originally directed by the Army to assemble the Super Fortress in the huge, much-discussed Cleveland Fisher Body plant, the company still is undertaking to produce more than 80 per cent of its original B-29 contract despite its assignment to build and assemble a new, long-range fighter plane in the Ohio factory.

The B-29 job represents the largest single contract held by the peacetime auto body builder. Altogether, there are 12 major assemblies being produced for the Super Fortress, including all the nacelles used by the final assembly plants operated by Boeing, Bell and Martin. The Fisher Shops on B-29 works are located in Cleveland, Detroit, Lansing and Grand Rapids.

THE END

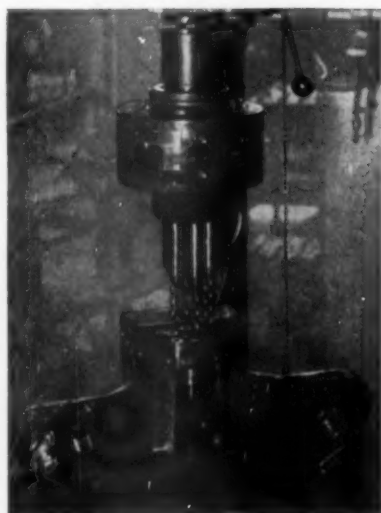
1944 RUSSIAN MODEL

● Russian production of passenger cars is expected soon in a "huge factory" in the Oral Mountains, according to a report from Moscow.

Construction of the plant began in the winter of 1941, a Soviet government paper states; the first engines and gear boxes were turned out in the spring of 1942; and assembly work now is under way.

According to a Detroit rumor the Russian passenger car bodies are being produced with late-model Chevrolet dies shipped to Russia when GM swung into all-out war production.

THE ANSWER TO A PRODUCTION PRAYER



Buhr

combines a fixture and bushing plate to drill 6-1/4" holes in right and left hand parts of an aircraft turret part.

Fixed center drill head has vertical adjustment in spindles.

Send blueprints to for suggestions and recommendations to solve your problems.

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Specialists in multiple spindle drilling, boring, reaming, tapping equipment.

BUHR MACHINE TOOL COMPANY

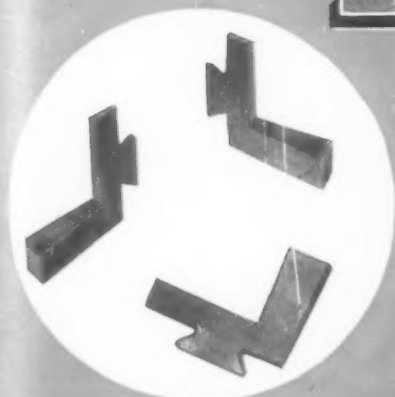
ANN ARBOR

MICHIGAN

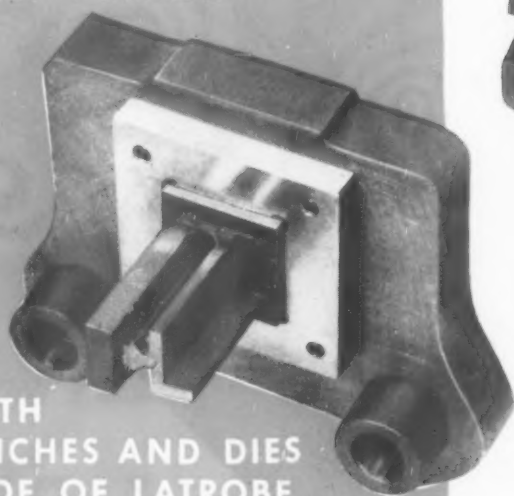
LATROBE

**MANGANO and
MANGANO SPECIAL**

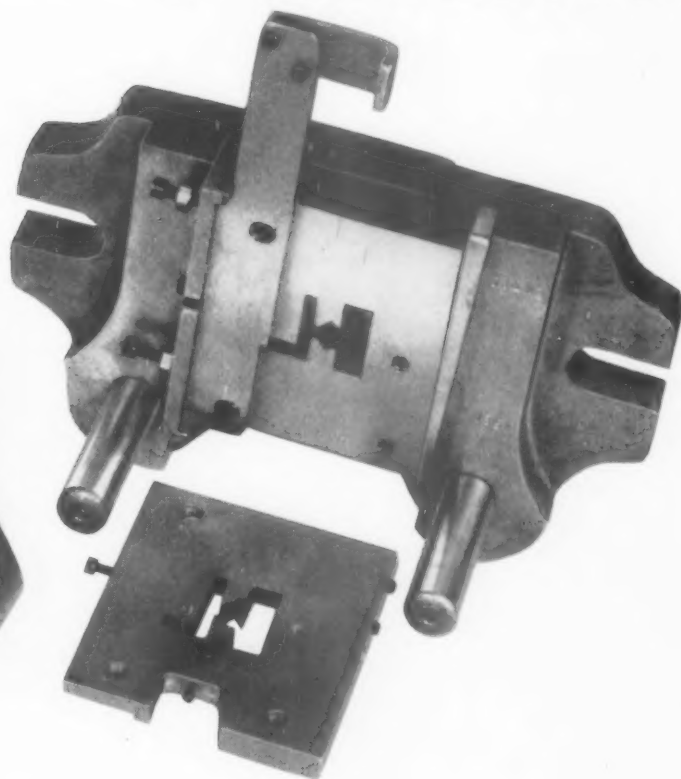
**OIL
HARDENING** *Die Steels*



**ACCURATE SHAPES
EASILY FORMED**



**WITH
PUNCHES AND DIES
MADE OF LATROBE
OIL-HARDENING STEEL**



**FOR THIS
COMMUTATOR**

THE illustrations show one of many jobs involving the production of component parts vital to our war machines. This type of work often demands the use of oil-hardening tool steel with assured minimum distortion.

In such cases, you can depend upon Latrobe Mangano or Mangano Special Die Steels. Write for information.

TYPICAL ANALYSIS

	C	Si	Mn	Cr	W
Mangano	.95	.30	1.65	.20	—
Mangano Spec'l	93	.30	1.20	.50	.50



Latrobe **ELECTRIC STEEL COMPANY**

MAIN OFFICES and PLANT -- LATROBE - PENNSYLVANIA

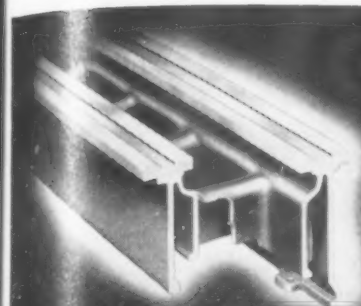


All of the great variety of small parts you see in this picture were de-burred successfully, in quantity, by the Roto-Finish process. This revolutionary new method of mechanical finishing is used with equal success on steel, brass, aluminum, stainless and nickel steel parts . . . on castings up to 75 pounds, as well as the tiny, delicate, threaded parts shown here.

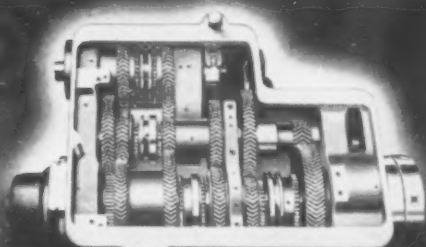
Hundreds of plants are using Roto-Finish today to effect important savings in time and costs over hand methods of de-burring, grinding, honing, and buffing. Precision tolerances are maintained and far better finishes secured. Send for complete information and let us process samples of your parts—without charge.

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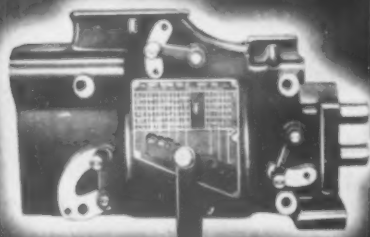
RIGID BED
CONSTRUCTION



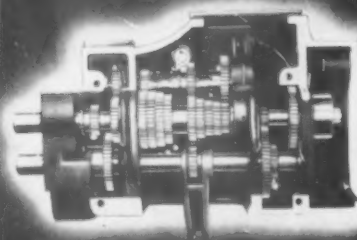
CONTINUOUS TOOTH 30° HELIX
HERRINGBONE GEARED HEAD

Sidney

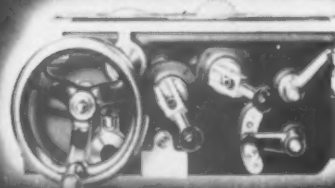
40TH ANNIVERSARY



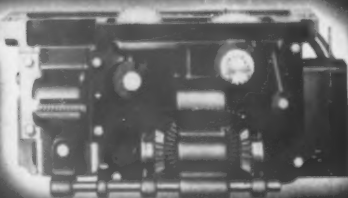
FRONT VIEW OF GEAR BOX



REAR VIEW OF GEAR BOX



FRONT VIEW OF DOUBLE WALL APRON



REAR VIEW OF DOUBLE WALL APRON



SIDNEY COMPOUND REST

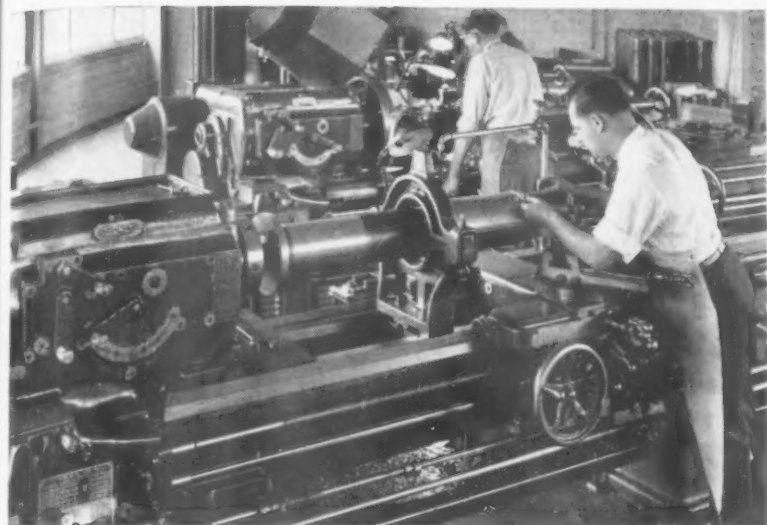


Photo Courtesy of Spencer Lens Co.

For close tolerance work **SIDNEY LATHES**

The versatility of Sidney Lathes is demonstrated here where two of the battery of Sidney lathes shown are handling distinctly different jobs—quickly—accurately—easily.

The sturdy bed construction—the perfect alignment of the component parts—the smooth flow of power from the continuous tooth Herringbone Geared Headstock assure continued accuracy and fine finish on all jobs.

When your work calls for extremely close tolerances—for high speeds and heavy feeds—for smooth dependable finish—put it on a Sidney Lathe.

Full descriptive bulletins on all sizes immediately available.



The **SIDNEY MACHINE TOOL Company**
Builders of Precision Machinery

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ESTABLISHED 1904

OHIO

How "Cutting Time" Was Reduced

(Right) Milling cutter with inserted blades set to negative-rake and negative-helix angles being used on a G. & L. Horizontal Boring, Drilling and Milling Machine.

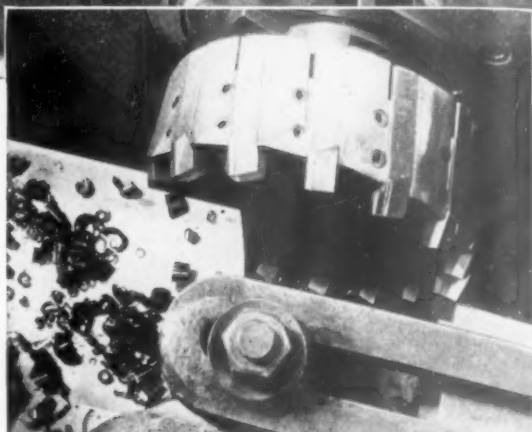


...with

G. & L. Horizontal Boring Machine Using Negative Rake Milling Cutter

Yes, you can use negative rake milling cutters on your G. & L. Horizontal Boring Machine. The speeds are there, the feeds are there and the rigidity is there. On work having large surfaces to be milled, you can use negative rake milling to advantage in lowering floor-to-floor time. When parts take a lot of time to set up, and require a great deal of boring and little milling, the use of negative rake cutters contributes less to the total floor-to-floor savings.

Generally, strict attention is paid to lowering set-up and handling time on horizontal boring machines. However, the additional savings available in the proper selection of tools should not be overlooked. This example of negative rake milling on



(Above) Illustration of cutter design and type of chips obtained.

a G. & L. is presented as but one way that this new cutting method can be applied to this machine. Perhaps the nature of your work will permit equal or better savings through the use of negative rake cutters.

DETAILS OF JOB

Part—Connecting rod for reciprocating steam engine.

Machine—G. & L. Horizontal Boring, Drilling and Milling Machine.

Cutter—Ten-inch diameter face milling cutter with fifteen inserted

T. C. tipped blades.

Depth of Cut— $\frac{3}{8}$ ".

Cutter Speed—220 R.P.M. (570' /min. approx.)

Feed per Tooth—.004".

Material—S.A.E. 1030 steel.

Cutting Time—2 minutes.

Former Time—30 minutes with 5" diameter high speed steel cutters.

Savings—28 minutes.

Additional Data

...covering the complete line of Giddings & Lewis machines and time-saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin No. TE54.

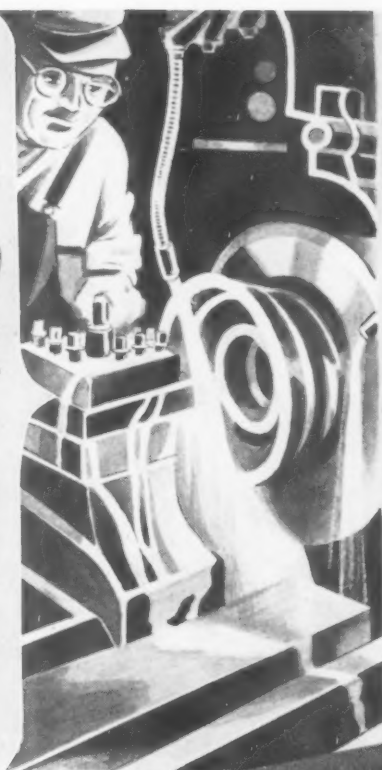


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use **TECO** *Cemented Carbide!*

TECO Cemented Carbide holds cutting edges—produces more pieces—stays on the job longer, because it has unusual resistance to wear and breakage.

You not only get increased production at lower tool cost, but need fewer replacements. Thus, inventories can be kept low . . . a wise precaution in event of sudden changes in production.

The greater durability and capacity of TECO Cemented Carbide are due to rigidly controlled hardness, density and uniformity of structure.

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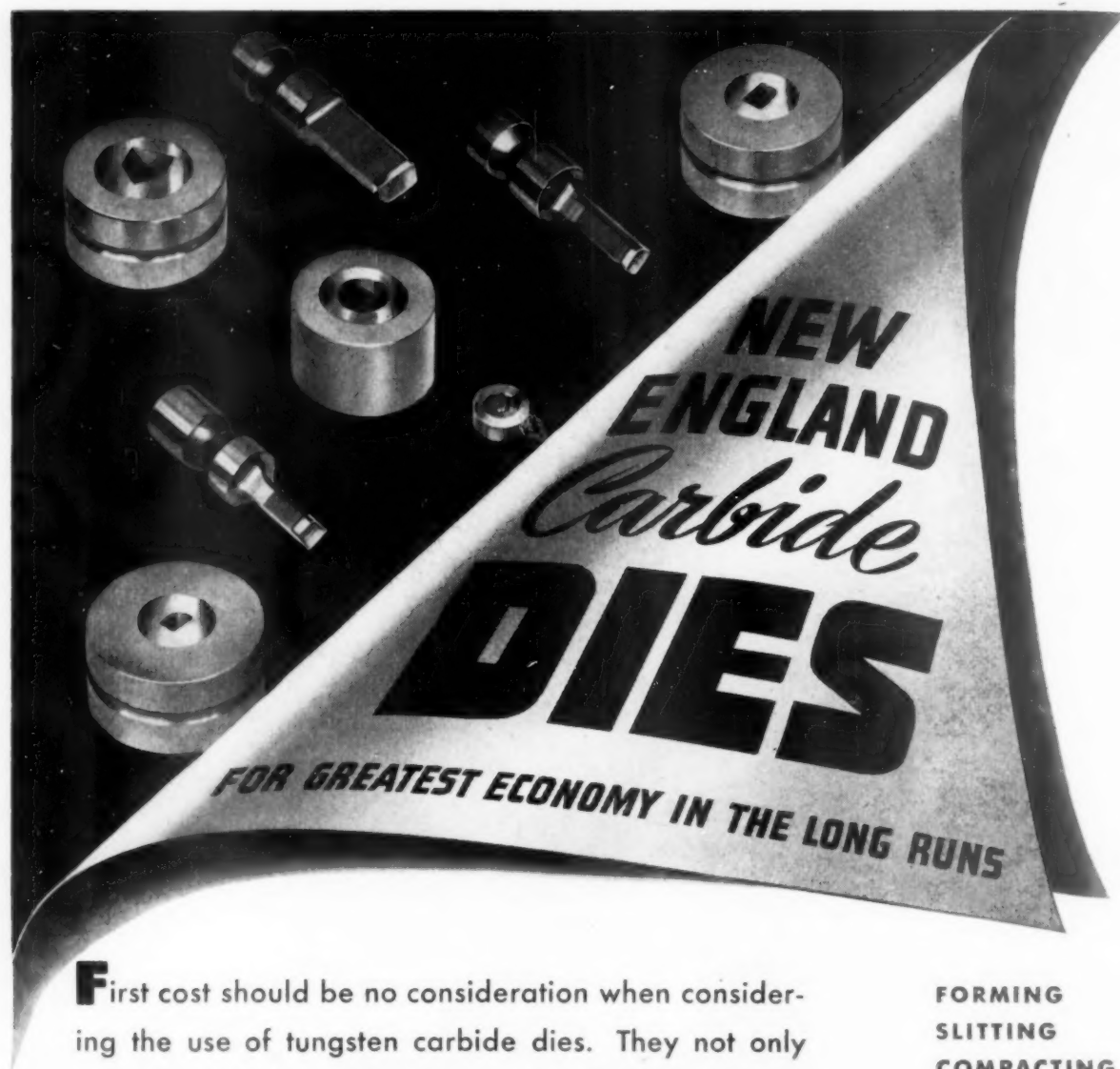
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Representative: Architects & Builders Bldg., Indianapolis, Ind.



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FOR GREATEST ECONOMY IN THE LONG RUNS

First cost should be no consideration when considering the use of tungsten carbide dies. They not only outlast steel dies many times, but they stay sharp longer between grinds—they give a better finish on the surface and edges of the parts produced—accuracy is built in to stay—they are cheaper in the long runs.

Tungsten carbide dies, made by New England, will give maximum satisfaction. You can be sure they will be made exactly as specified, *plus* that New England extra—*mirror finish*. Why not send us your drawings (plus complete information) for an estimate—there is no obligation.

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SLITTING
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BLANKING
PERFORATING
BENDING
SLOTING
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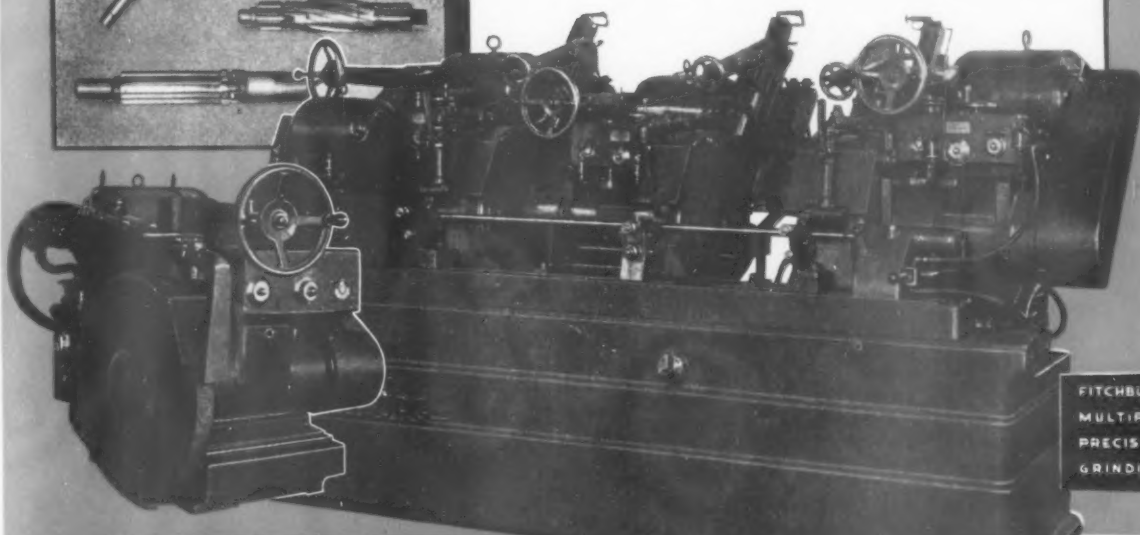
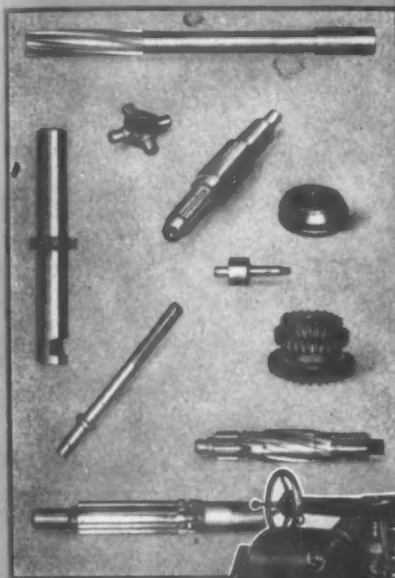
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Special machines mounting Standard Bowgage Head Grinding Wheel units, like the one illustrated, enable the precision grinding of two or more dimensions at a single handling. Grinding is completed within the time required for the longest single operation. On mass production work these Fitchburg grinders rapidly repay their cost.

On hundreds of parts like those shown, for machine, automotive or ordinance work, Fitchburg engineers can help you to make sure your orders are filled on time, and at the lowest possible cost. It will not obligate you to mail in your blueprints for study. Catalog shows wide range of other successful applications. Write for a copy today on your business letterhead.

When installing special grinding equipment it is important to remember that the Fitchburg Bowgage Grinding Wheelhead is a self-contained standard unit. It can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.



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But:-



Repeated tests will prove you'll find no better taps than those bearing the "WINTER" name. Deliveries **HAVE** been slow because of war demands, and we're genuinely sorry for that; but *precision* cannot be lightly regarded when so much depends on the holding power of a single threaded part. It is the accuracy of the TAP that insures a tight connection. So long as that accuracy is in our keeping WINTER craftsmen will take the time and exert the skill needed to make sure the resulting threaded parts will not fail.

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Every day, in plants all over the country, time is lost, production is reduced and the quality of grinding is lowered because of inexperience in the use of diamond tools.

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has prepared the booklet shown above. We would like to send you a copy free of charge.

This book tells why grinding wheels need dressing and when and how they should be dressed. It describes and illustrates the correct method for setting up and using the diamond tool. It discusses common defects in dressing technique and shows the results on the actual work. It tells how to avoid misuse and abuse of valuable diamond tools, how to avoid excessive resetting cost, how to get more work from these tools through proper use.

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AND THE METAL IS CUT!



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Metal Cutting Machine**

This new, high-speed DeWalt will out-perform the ordinary types of "light metal" cutting machines you have heretofore been able to buy to do comparable work. It cuts metal fast, accurately, and with greater safety. *And it's built to last.*

One manufacturer, who has a battery of these high-speed DeWalts, is cutting S. A. E. 52100 solid bearing steel into $1\frac{5}{16}$ " lengths—at the rate of 600 to 650 pieces per hour per machine, using women operators. The machines have already cut 4,500,000 pieces and are still going strong.

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● Our large stock of die accessories of all kinds assures prompt shipment.

Dowel pins in 163 standard sizes (plus oversizes) ground to exact diameters, carburized, hardened and tempered to case hardness Rockwell C. 60-62 effective to depth .020" and core hardness Rockwell C. 50-54.

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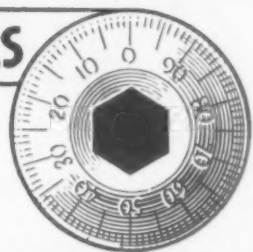
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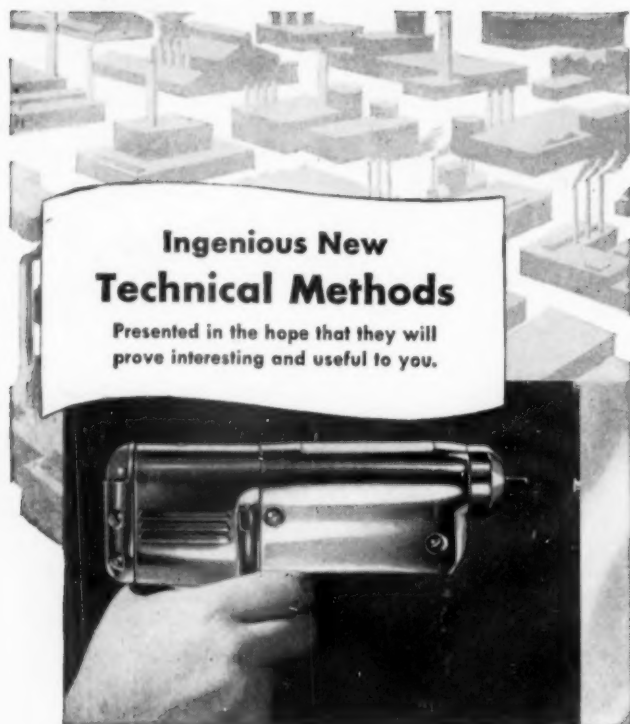


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New Air Tool Drives "blind" Rivets Accurately ... Automatically

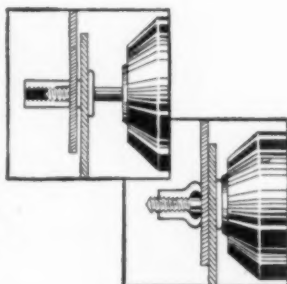
Installing "blind" RIVNUTS quickly with precise, positive upset while working entirely from one side is now possible with the recently developed Auto RIV-Driver. Completely automatic, the tool runs a threaded mandrel into a Rivnut, upsets it, backs the mandrel out and stops the tool. Operators simply press a throttle; make no manual adjustments for any operation. Rivnuts are installed 6 to 8 times faster than formerly; rejects are almost completely eliminated.

The tool can be adjusted to upset at any depth required. Once set, adjustment is tamper-proof—every Rivnut is driven accurately and uniformly. An indicator on the tool handle lights when the upset is correct; does not light if Rivnut is improperly headed.

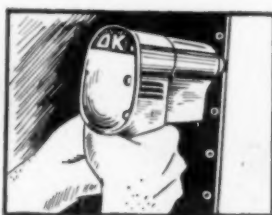
Powered by compressed air, the Auto RIV-Driver weighs just 4¼ pounds; is 9½ inches long; balanced for efficient handling by women operators.

You all know that our fighting men need the finest quality materials that we here at home can produce. That goes for Wrigley's Spearmint, Doublemint and "Juicy Fruit" chewing gum, too. Our stock pile of raw materials that goes into the making of Quality chewing gum is getting lower and lower. Until we can again build up our raw material inventory, we are sending all of our limited output of Quality chewing gum to our fighting men and women overseas, only.

You can get complete information from the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago 6, Ill.



Rivnuts (mfd. by B. F. Goodrich Co.) are internally-threaded tubular rivets which can be installed "blind" while working entirely from one side of the job.



Automatic action, positive depth control and visual indicator assure correct and uniform installation of rivnuts with new Auto RIV-Driver.

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CARTRIDGE CASE DIES ... with Talide Nibs made of solid Tungsten Carbide, are producing millions of brass and steel cartridge cases in sizes 20 m.m. through 105 m.m., small calibre bullet cases and jackets, and primer cups with better finish, longer life, closer tolerance, and fewer rejects ... including cupping, drawing, heading, and tapering operations. Talide Sheet-Metal Dies are also being used for deep drawing all types of metal products including tubes, cylinders, cans and containers.



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Talide-Tipped Tools for all types of turning, boring and facing operations on steels, cast iron and non-ferrous metals and non-metallic materials. Send for catalog No. 43-T.



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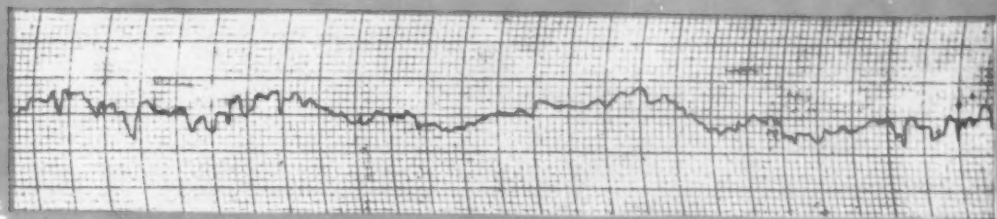


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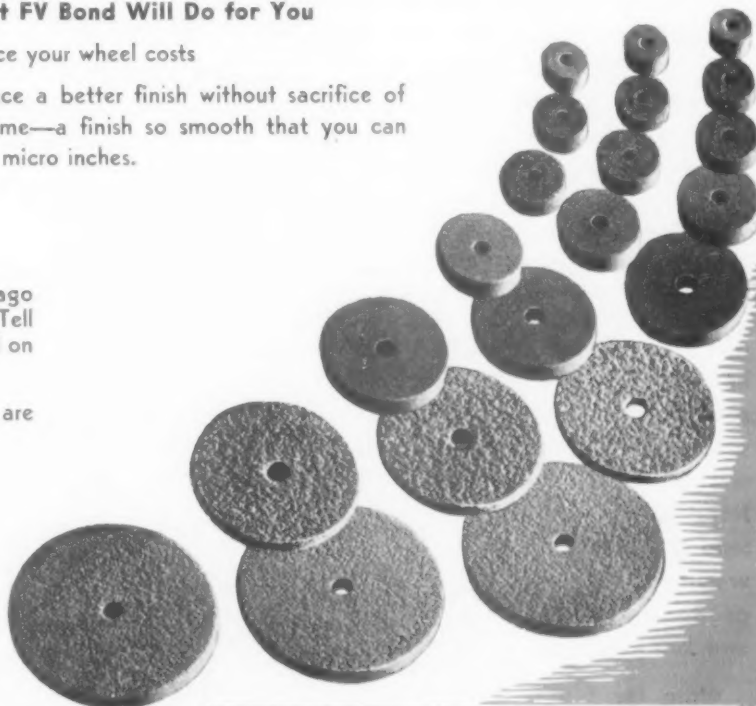


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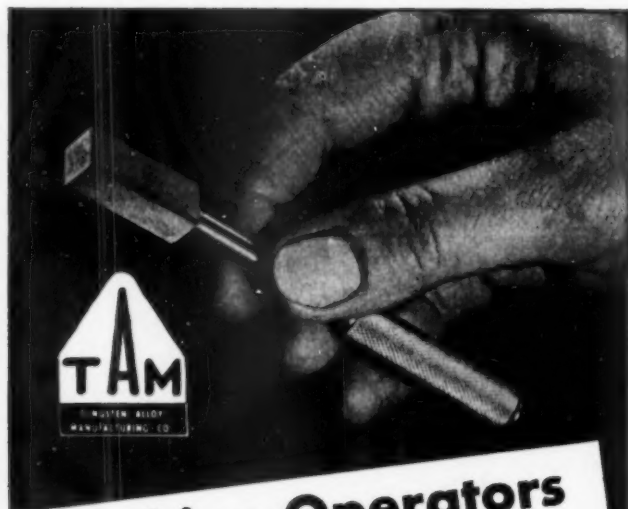
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TAMALOY
DIAMOND HONES**

NO wonder there's such a large demand for these handy, pocket-size hones! Operators are finding that tools last longer, need less regrinding, retain their original cutting accuracy—with just a light touching-up from time to time with a Tamaloy Hone. And the hone's convenient shape and size permit working in close quarters, saving time and often eliminating the necessity of removing the tool from holder for honing.

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FLASH!

Due to the great demand for Tamaloy Diamond Hones and the resulting manufacturing economies, a reduction in price has been made possible. Now \$12, formerly \$15 each.

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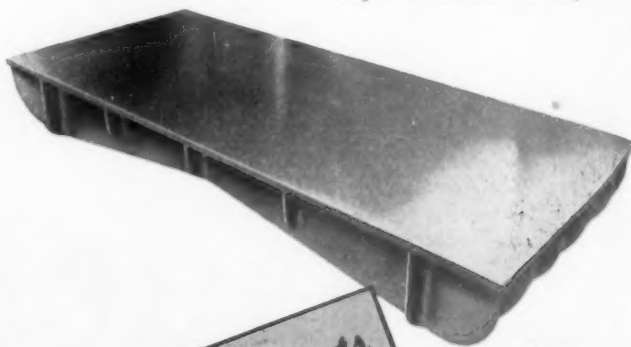
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You cannot afford to take chances with unreliable checking and measuring equipment—particularly surface plates. The depleting ranks of skilled help emphasizes the importance of providing the men you now have with the best surface plates available.

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How **BIG** Is Your **TAP PROBLEM?**



Today, manufacturers are facing unfamiliar tapping problems arising from the use of new metals, and from new tolerance requirements.

Besly's answer to one challenge of this type was the 40 pound tap 23 inches long, shown above—designed by Besly engineers to meet an emergency job. This is cited as one example out of many "unusual" situations met—and overcome.

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CHARLES H. BESLY AND COMPANY
118 N. Clinton Street, Chicago 6, Illinois Factory: Beloit, Wisconsin



Charles H. Besly and Company were awarded the Army-Navy "E" on December 1, 1943, for their contribution to Production.



Write for Catalog No. 67—a compendium of useful knowledge for tap users.

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**BESLY TAPS • BESLY TITAN ABRASIVE WHEELS
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DRILL CHUCKS



COMPLETE RANGE OF SIZES
FOR DRILLS FROM 1/32" TO 1"



ALCO Drill Chucks fit all screw machines . . . Drills are held securely without the use of bushings . . . Full floating feature of the ALCO holder insures concentric drilling even on your old machines . . . Each ALCO Drill Chuck has a wide range of adjustability so that one chuck will do the work of several . . . Produce perfect work faster.

Don't overload your tool room with rush orders for drill bushings — Use ALCO Drill Chucks which hold drills securely WITHOUT BUSHINGS. Modernize all your machines now with ALCO Tool Holders.

Send for Catalog No. 4 showing complete line of ALCO Efficient Tools.

ALCO EFFICIENT TOOLS

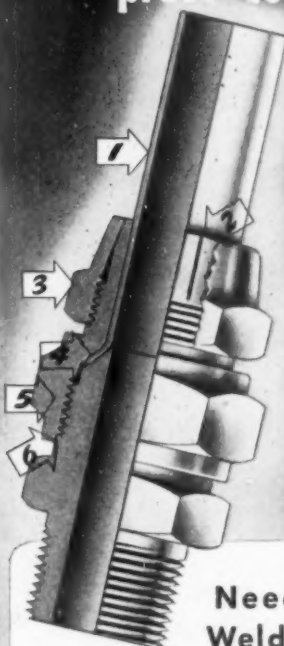
THE ALCO TOOL CO., 453 BIRDSEYE ST., BRIDGEPORT, CONN.
Chicago Office: 6219 S. Kenwood Ave., Telephone: Hyde Park 6807
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COLLET GRIP

Seals as it grips

TUBE FITTINGS

For Leak-proof, Vibration-proof Connections!



1 Permit use of tubing in wide range of wall thicknesses.

2 SLOTTED collet insures uniform grip of tubing surface, protecting flare seal.

3 COMPRESSION NUT compresses Collet Nut to tube, forming permanent collet grip that cannot loosen.

4 DESIGN directs pulling stresses and vibration strains away from angle of flare.

5 COLLET NUT has long bearing surface which grips tube securely beyond the flare.

6 Easy to assemble and disassemble. Use repeatedly.

Need No Threading Welding or Soldering

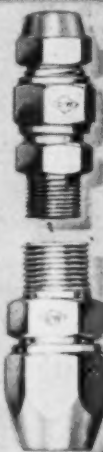
"Collet Grip" fittings provide connections as strong as the tubing itself—without threading, welding or soldering. A compression nut compresses the collet nut to tube, giving it a firm, uniform grip that cannot loosen under vibration or shock. The long bearing surface of the collet nut puts the heavy load on the tube and fitting—not on the flare. "Collet Grip" fittings work perfectly on metal tubing having a wide variety of wall thicknesses, and permit quick, easy installation of short lengths of tubing in close quarters, without bending or damage to tube.

Send for Copy of Catalog 43 containing complete information.



COTNER-WILKINSON COMPANY

Division of Logansport Machine Company, Inc.
902 PAYSON ROAD • LOGANSPORT, IND.



DOUBLE NUT COLLET GRIPS

—as illustrated above, are made in 5 standard shapes. Special shapes and sizes to specifications.



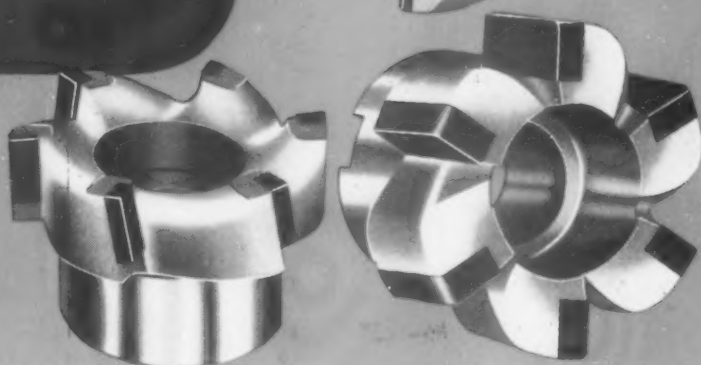
SINGLE NUT COLLET GRIPS

Simplified for close work, yet retaining all features of Collet Grip design. Five standard shapes, sizes from 1/4" to 1". Special sizes, shapes to specifications.



Want Super Milling?

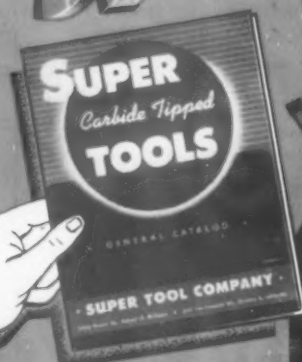
USE SUPER MILLING CUTTERS!



Plain milling—side milling—face milling—end milling—whatever the types of milling operation you are doing, try a Super Carbide-Tipped Milling Cutter . . . and see what we mean by Super Performance! For in the Super Tool Line you'll find a milling cutter for any of the above types of milling operation—one that will bring faster cutting, cleaner cutting, finer finishes, greater accuracy and longer cutter life to that milling job.

Super Carbide-Tipped Milling Cutters are made in the complete range of standard sizes. That's another reason why they are **MONEY SAVERS!** Super Tool Milling Cutter Economy starts with the first cost and continues on through every operation in the cutter's long life.

Try Super Carbide-Tipped Milling Cutters **TO-DAY**, and you'll agree . . . For Super Milling use Super Milling Cutters!

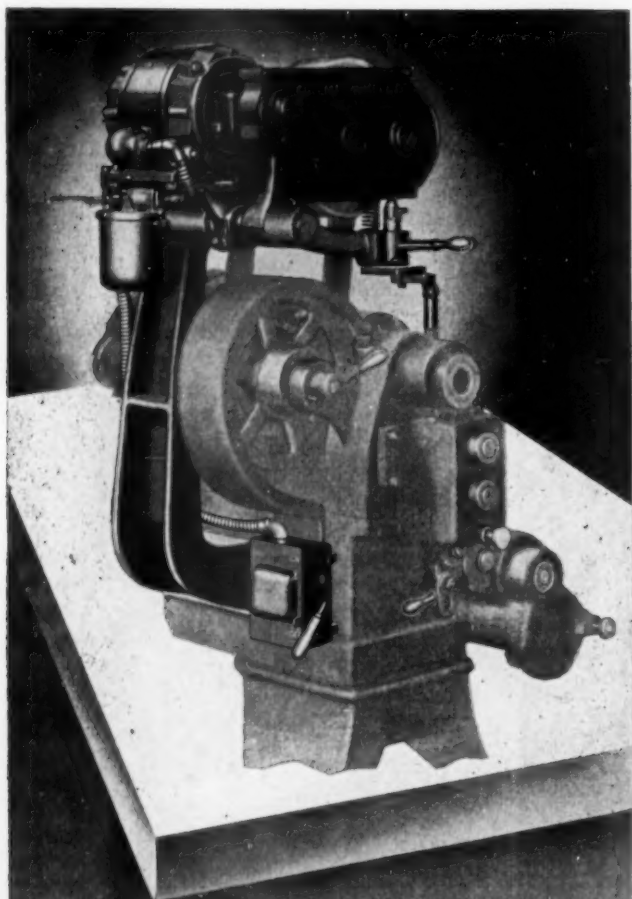


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SUPER TOOL COMPANY

Carbide Tipped Tools

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Get 25% More Output from the Machines You Have with **CULLMAN DRIVES**

Cullman Drives will modernize shaft and belt driven lathes, screw machines, shapers, and similar equipment to give an increased output of more than 25%.

Cullman Drives give individual machine control, have greater flexibility, and are safer in operation than overhead line shaft drives. They permit the utmost in efficient arrangement for work flow and lighting.

Cullman Drives are sturdy and built for long life. They operate with belt-drive smoothness. They are easy to install and economical to buy. They are built for motors from 1/4 to 15 H. P. Prompt delivery can be made on most sizes.

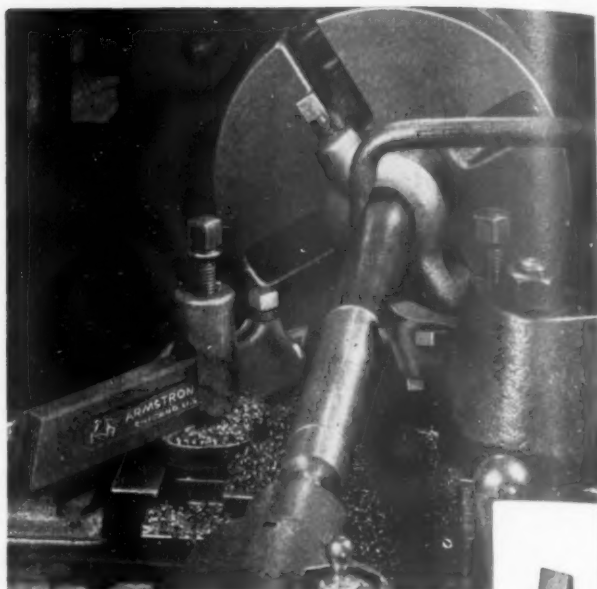
Write for full information on Cullman Drives and the 60 day trial plan.

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ARMSTRONG

Carbide TOOL HOLDERS



Standard Shape Armide Cutters

Armide (Carbide Tipped) Cutters and ARMSTRONG Carbide TOOL HOLDERS can increase your output on long-runs and tough or hard steels. They increase the interval between tool re-grindings from 20 to 50 times. They cut the toughest and hardest steels easily.

Armide Cutters come in 5 standard cutting shapes—"A" Right-hand Turning, "B" Left-hand Turning, "C" Square Nose, "D" Round Nose (for general turning and facing), and "E" 60° Threading. 10 sizes.

ARMSTRONG Carbide TOOL HOLDERS, come with "Straight", "R. H. Off-set" or "L.H. Off-set" Shanks. They hold cutters at 180° (proper for carbide) provide extended, close-up support to the cutting edge, and are extremely rigid.

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ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

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Eastern Warehouse & Sales:
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"A"



"B"



"C"



"D"



"E"

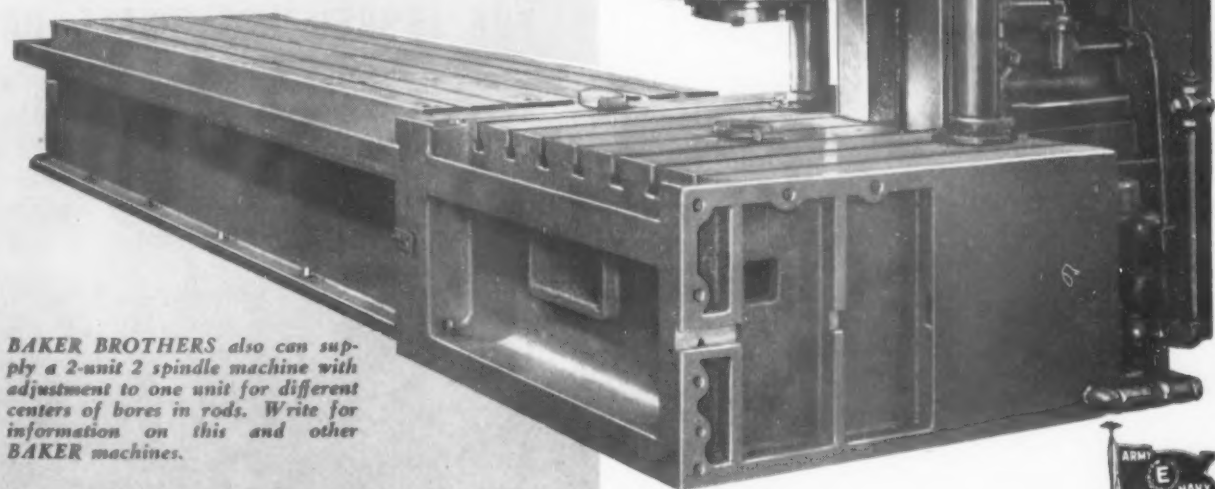
BAKER

THIS Model 60-HO BAKER machine is a new adaptation of the 60-HO Extra Heavy Duty Single-Spindle Vertical Boring Machine. Designed especially for heavy-duty machining of main and side rods for railroad equipment, it has an extended side bed for handling trepanning and rough and finish boring of large pieces.

This characteristic application of a standard machine to a specialized job illustrates the established BAKER policy of engineering service for greater production efficiency.

NOTE THESE BAKER MODEL 60-HO FEATURES

★ Heavy-duty spindle 6.250" diameter in lower head bushings ★ Flanged spindle end for adapting trepanning cutter and boring cutter heads direct to spindle ★ BAKER hydraulic feed system to provide complete automatic cycle to head ★ Convenient location of push-button controls for stopping motors and starting head cycle ★ Side end bed of heavy construction for outer support to fixture for holding rods ★ Main work table arranged with lower pilot bushings for lower piloting long bars.



BAKER BROTHERS also can supply a 2-unit 2 spindle machine with adjustment to one unit for different centers of bores in rods. Write for information on this and other BAKER machines.

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SINCE 1867:

"MACHINES
STURDY AND EFFICIENT,
AS FINE AS CAN BE BUILT"

Baker Brothers, Inc.

Toledo, 10, Ohio

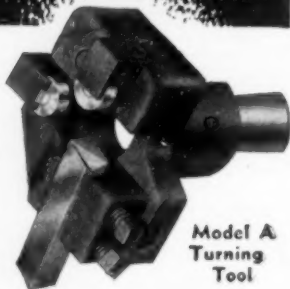
Machines for
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FULL SCREW MACHINE PRODUCTION *with* BOYAR-SCHULTZ TOOLS

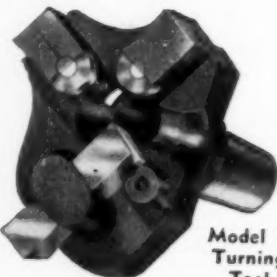
The way to make sure of full screw machine production is to use the best tools available.

In Boyar-Schultz Screw Machine Tools you will find the desirable combination of accuracy, sturdiness and speedy operation that assures more piece parts, less rejections and less set-up time.

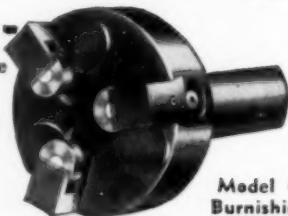
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CORPORATION**
2116 Walnut Street
CHICAGO 12, ILLINOIS



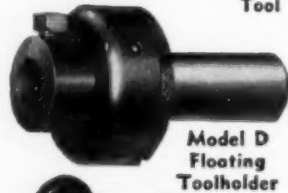
Model A
Turning
Tool



Model B
Turning
Tool



Model C
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Tool



Model D
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Toolholder



Model G
Universal
Grinding
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The Wilder Micro Projector is an optical inspection instrument used to check and inspect parts, tools and gages by means of a magnified shadow image. In many instances, particularly with odd-shaped pieces magnification and comparison against drawings is the only satisfactory way to achieve results.



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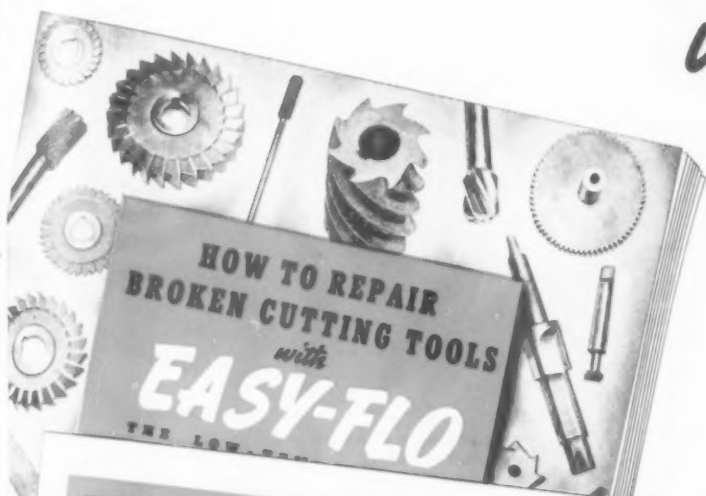
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The Wilder Projector is a simple, compact yet accurate instrument designed to be produced at a reasonable price within reach of everyone. Write today for complete four-page folder and quotation.

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A NEW CATALOG TELLS HOW TO *save valuable tools* with **EASY-FLO!**



TYPICAL EXAMPLES OF EASY-FLO TOOL REPAIRS

The examples on the following pages are intended, not to establish any hard and fast rules, but to show methods being used in brazing various types of broken tools with Easy-Flo which are producing entirely satisfactory results.

The best way to find out just how easily and quickly you can put broken tools back to work with Easy-Flo is to try it. Our cooperation is always available.

BAND SAWS

The use of silver alloys for brazing cutting tools is not new. One of the earliest uses was in the making and repair of further mill saws. The illustration shows a band saw blade being repaired with Easy-Flo. The blade was ground to a new joint and, after the repair, it was tested with a strip of silver alloy between them. To increase on heavy duty band saws provides increased strength and ductility of the joints in production.

EASY-FLO
PREPARED

BROACHES



LARGER SHAFT ON DRILL

Where larger shafts were required on drills in multiple, inexpensive repairs were made by Easy-Flo. The drill was ground to the required O.D. and then the shaft was inserted. The drill was then ground to the original size and the shaft was secured with Easy-Flo. The drill was then tested and found to be in perfect condition.

The five broaches above, when new, cost upwards of \$1,000. They broke in service and all were repaired with Easy-Flo. The repairs were made in fully planned on, both parts in very good work for



This is a keyway broach which was broken by overloading and bending back on each side. The Easy-Flo was applied to the broken ends and the broach was then tested. It could be done for many other types of tools.

MILLING CUTTERS



The 4" x 1/2" milling cutter was readily repaired by Easy-Flo. The broken surfaces were thoroughly cleaned and prepared with Easy-Flo. The cutter was then tested and found to be in perfect condition.

FORM CUTTERS



As shown in the left, this form cutter is new in the nature after repairing of wear. The cutter was then tested and found to be in perfect condition.

It's our new Bulletin No. 14 — gives full information about the low-temperature EASY-FLO method of brazing broken cutting tools — a method that is sweeping through industry because it is so simple, reliable and economical.

It's a method that is practical for any shop. The simple procedure is fully explained with many examples of actual applications to broaches, milling cutters, forming tools, drills and taps, band and circular saws, etc.

**MAIL YOUR REQUEST TODAY
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OF
BULLETIN No. 14**

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(R) Metal Slitting Saws

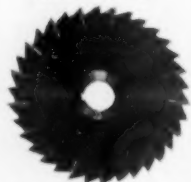
**Majority of Sizes Available
for Immediate Delivery!**



Hollow Ground Saw



Side Chip Saw



Staggered Teeth Saw

Slitting a surface grinder front spindle bearing (shown above) is only one of countless operations performed by these Circle R saws.

The Circle R side cut slitting saw is designed to take deep cuts, split chips and eliminate dragging while the Circle R Slitting Saw, with staggered teeth, is for use where deep cuts or heavier feeds are required. The shearing action of the peripheral teeth and more chip clearance on the sides give this latter saw an advantage over the regular side chip clearance.

For complete details and specifications on these and other Circular Saws, send for Catalog K.

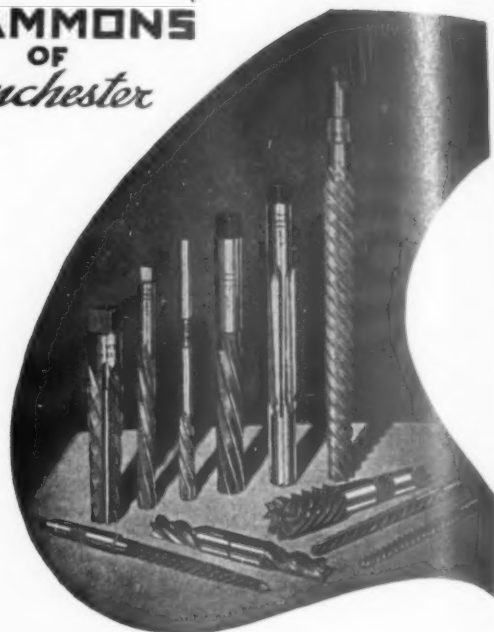


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PROVIDENCE 5, R. I.

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OF
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Hanna Valves

Hanna Unitite Valves are designed and precision built to provide the dependable, fast and simple control that machines and equipment must have today. They are rugged, packless-type instruments with positive seating assured through the construction of disc and stem. They remain permanently tight—require no maintenance (except oiling) over their long life. Used as straightway, 3-way or 4-way valves, they operate at pressures up to 250 lbs. with air, oil or water— $\frac{3}{8}$ ", $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1 and $1\frac{1}{4}$ " pipe sizes in three mounting styles.

In addition Hanna has the "Tip-Toe" action foot valves and speed control valves. The new Hanna Valve bulletin gives full details. Write for it today.

HANNA ENGINEERING WORKS

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WHEN YOU "*Pick up the Threads*" OF PEACETIME PRODUCTION

—you will do it with greater ease and assurance, thanks to *Threadwell* Taps and the vastly superior resources of tapmaking skill, production, testing and inspection facilities created at *Threadwell* to meet war production demands.

Your postwar service-of-supply on Taps will be better than ever, too. The *Threadwell* distributor in your locality was selected for his ability and his willingness to match the intimate personal attention given by *Threadwell* to the needs of every *Threadwell* Tap user. His record of Tap supply service to war industry, however extreme or urgent the demands, has been consistently excellent.

You can continue to count on *Threadwell* Taps, the organization that makes them and the *Threadwell* distributor.

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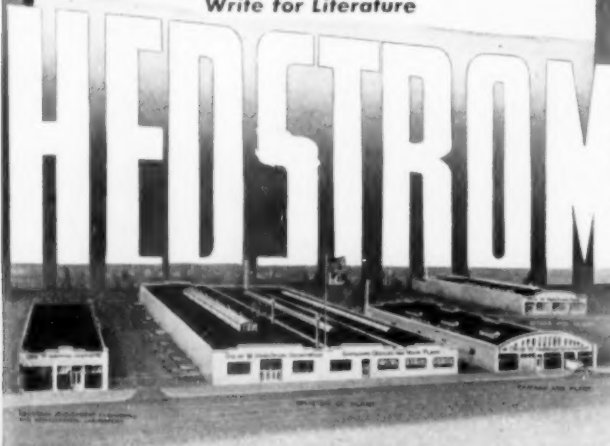
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TAP AND DIE COMPANY • GREENFIELD, MASSACHUSETTS, U. S. A.

an element of Victory OH 38 Easily Machinable

An Aluminum Alloy—Non-Heat Treated. The perfected metal that surpasses all others for a wide variety of machining operations. Non-corrosive—Easy on machine tools—Holds threads without stripping. Its light weight reduces table and machine loads and increases tooling accuracy. 5 years of proven superiority in hundreds of plants. OH 38 is an exclusive Hedstrom product.

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Manufacturers of Aluminum, Brass, Bronze and High Conductivity Copper Castings.
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DIAMONDS for Victory



New!

HANDL-NIB
(Trademark Reg.)

RE-SET-ABLE
DOUBLE DUTY
DIAMOND DRESSER

Ejector Rod

2 TOOLS For the PRICE of ONE

Heavy Duty Tool with 7/16" shank "BIG-HED-NIB" interchangeable For MACHINE or HAND TOOL DRESSING

This new DTC "HANDL-NIB" easily dresses wheel faces up to 2" wide with a single rotation of the wrist. Patents pending.

—DETACHMENT INSTRUCTIONS—

For separate use of "BIG-HED-NIB" in adaptor on machine simply tap on ejector rod to release nib from "HANDL-NIB" holder.

Can be returned to handle in a jiffy for hand dressing.

Supplied Free when requested with orders for RE-SET-ABLE LOC-KEY-SET BIG-HED-NIBS of 2 carats or over.

Three grades of diamonds. Common quality \$12 per carat. Medium quality \$24 per carat. Select quality \$48 per carat.

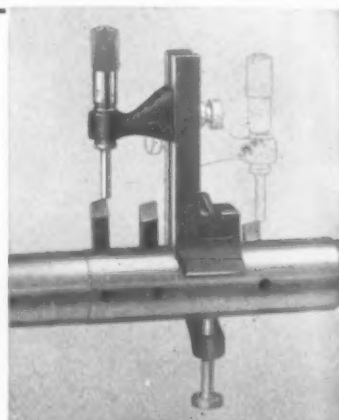
"For a New Front" buy RE-SET-ABLE

DIAMOND TOOL COMPANY Not Inc. - - - 932 E. 41st Street
SHELDON M. BOOTH, President CHICAGO 15, ILL.

SAVE TIME

ON BORING-TOOL SETTING

Take ONE trial cut, mike it, then use the Bartelt Pedestal Micrometer as shown here to move the tool the exact amount required to bring the next and final cut exactly to size. Or, set the tool from the O.D. of the bar, and make only one cut.



MODEL "A"

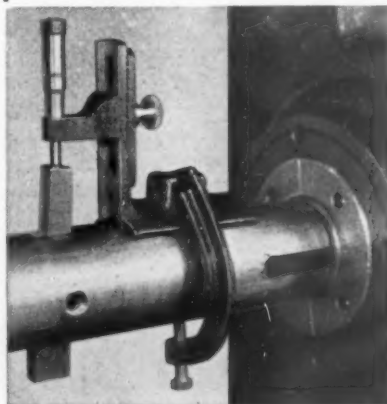
MODEL "B"

BARTELT PEDESTAL MICROMETERS

Made in two models as illustrated. Dial indicators can be furnished in place of micrometer heads. Useful for many other gaging, set-up, and inspection jobs. Write for circular.

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*When You Order
Your Favorite Brand of
HACK SAW BLADES
Specify this —*

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**INGERSOLL
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"Lucky for us that
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**5 YEARS
EXPERIENCE**

*in the Production of
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**HIGH SPEED
STEEL for
HACK SAW BLADES**

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Specify Ingersoll D-B-L Steel for
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Record of Past Performance.

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D-B-L**

(Tungsten 5.00-6.00)
(Molybdenum . . . 4.00-5.00)

The remarkable performance of Ingersoll D-B-L . . . its relative freedom from decarburization . . . its tough cutting quality and its high impact resistance . . . plus its lower cost, have made it a wartime favorite.

**INGERSOLL STEEL & DISC DIVISION
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Plants: New Castle, Ind.; Chicago, Ill.; Kalamazoo, Mich.

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Alloy Steels
Armor Plate
Clutch Plate Steels

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Soft Center Steels
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Knife Steels
TEM-CROSS Steel
Ingaclad (Stainless-Clad Steel)

Stainless Steels and Saw Steels,
including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels

*"A
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Product"*



SECOMET DIAMOND WHEELS

Resinoid-bonded for grinding of carbide-tipped tools in large quantities, or on a production basis. Their extremely fast cutting action provides rapid stock removal. Also for fixed feed, precision grinding operations, such as cylindrical, surfacing, internal and cutter grinding, because of their free and cool cutting action and ability to hold size.

Metal-bonded for off-hand grinding, where the cutting surface is sometimes subjected to extreme abrading action.

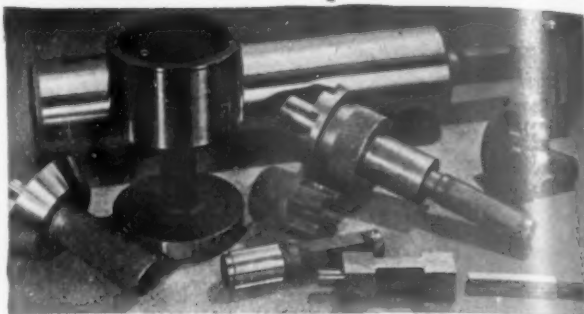
Made in all standard types and diameters, in diamond concentrations to suit your requirements.

Catalog on request.

J. K. SMIT & SONS
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PRECISION GAGES

Axelson Gages are tailored for precision—often to tolerances as close as a "tenth of a tenth." Expert craftsmen operate Axelson's scientific gage-making facilities under *controlled atmospheric conditions*. Using variation-proof metals processed by specially developed heat-and-freezing equipment, they are creating *precision-perfect* gages for hundreds of war plants. Axelson-built Gages will accelerate production under the most rigid precision standards. All gages are made to order, but due to "peace-pushing" production schedules, *quick delivery* is possible. Let Axelson help you with your gage problems NOW!

AXELSON MANUFACTURING CO.

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from simplest
DIES
to most exacting

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**GAUGES — TOOLS — FIXTURES
JIGS — SPECIAL MACHINES
DESIGNING & ENGINEERING
HIGH PRODUCTION STAMPING**

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BARTH STAMPING & MACHINE WORKS

Die & Tool Makers

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[illegible]

Die made in 10
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5 Hours Saved on Each
Part.

230 Aluminum Parts
cut in 26 minutes

An Hour's Work in 15
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SEE IT WORK. A factory trained man will call at your plant and show your foremen what the DoALL can do to save material, time, and man hours.



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NEW EQUIPMENT

• Materials + Processing •

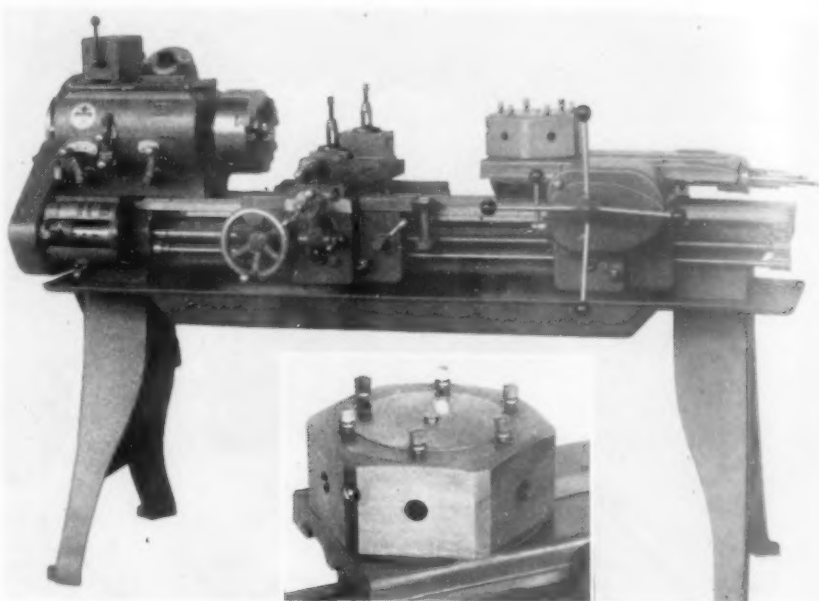
T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

LATHE EQUIPPED WITH INTERCHANGEABLE TURRET (N84)

An interchangeable hexagon bed turret is the chief feature of the new 13" and 15" lathes introduced by R. K. LeBlond Machine Tool Co.

The turret, available with power feed or hand feed only, is exceptionally large, measuring 9" across faces, and contributes to a considerably longer life in alignment and accuracy, the company states. It is a six-station turret, supported on double preloaded adjustable precision roller bearings, rolling on a large bearing face. Bearings are automatically indexed to the next station when the ram is returned against the indexing trip by the pilot wheel, or it can be spun by hand to any face of the turret in either direction. Forward feed of the ram is automatically disengaged when the stop screws move against the trip.

The total length of ram travel with either hand or power feed is 6-1/4". Since the drive for the turret apron is taken from the feed rod, the full range of feeds (.0025 to .144) is available and selected quickly by the quick-change feed box.



Le Blond Lathe, Equipped with Extra Large Hexagonal Turret (Inset)

DIE-CASTERS DESIGNED FOR QUICK CHANGEOVER (N85)

Reed-Prentice Corporation has announced introduction of two new die-casting machines.

Model No. 1-1/2G is designed especially for use with aluminum, magnesium, and brass alloys. The No. 1-1/2 type is for use with zinc, tin, or lead base alloys. Principal feature of the machines is construction design which provides for quick change from the No.

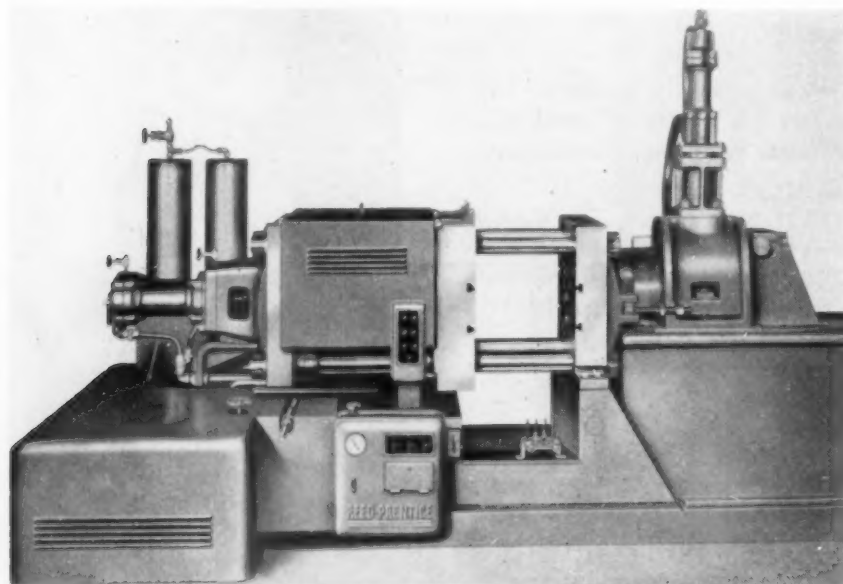
INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

1-1/2G type to the No. 1-1/2 type or vice versa, in four to five hours. A cold chamber attachment or furnace attachment as required may be purchased

separately, thereby keeping investment costs to a minimum where but one machine is desired.

Features include one-piece welded base and hydraulic tank, heavy steel castings for die plates, arrangements for automatic ejection of castings and easy application of core-pulling cylinders for operation through an electric pushbutton station, and both manual and semi-automatic controls with electric interlock for operator's safety and to prevent shooting of metal until dies are securely closed.



Reed-Prentice Die Casting Machine For Use with Soft Metals

MICROMETER COMPARATOR (N86) CHECKS SCREW THREADS

Especially well suited to precision inspection of screw threads for accuracy of pitch diameters, a new micrometer comparator has been developed by Federal Products Corp.

The outstanding characteristic of the device is that it provides its own device for setting at the specified dimension. The micrometer head replaces gage blocks and master gages for setting the comparator.

An auxiliary weight is provided to give the required tension to all threads over 20 pitch. The company states that the dial indicator comparator provides an instrument which is faster than the usual micrometer and is subject to less human variation.

NEW MACHINE PROVIDES AUTOMATIC INSPECTION (N87)

Interlakes Engineering Co. announces it has perfected a device which makes possible checking of di-

(Continued on page 166)

THE TOOL ENGINEER

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Request the information and service you desire and keep your library up-to-date...

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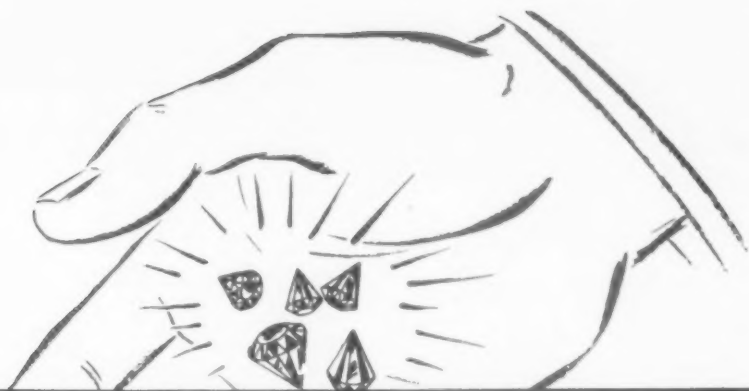
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You Wouldn't throw away good diamonds!

THE **ZURIUM**

**BONDING PROCESS
LOCKS DIAMONDS
SECURELY IN ...**

SUPER-CUT



DIAMOND WHEELS

SUPER-CUT Diamond Wheels, thanks to the closely-guarded Zurium bonding process, hold diamonds in a vise-like grip that cannot loosen! Good diamonds and good money are not wasted.

SUPER-CUT Zurium Bonded Diamond Wheels are built up of layer upon layer of diamonds, **solidly** imbedded in a firm matrix! As one layer completes its work, this matrix slowly abrades and brings to the surface another layer. Keen, sharp, fast-cutting diamonds are always firmly in place at the abrasive surface throughout the amazingly long life of all Super-Cut Zurium Bonded Diamond Wheels!

Industrial Abrasives, Inc. will welcome the opportunity to demonstrate—in your plant, on **your** work—how these Zurium-bonded diamond wheels will reduce your grinding and finishing costs! Write today for specific information and description of Super-Cut Wheels available for immediate delivery.

Super-Cut Diamond Wheels

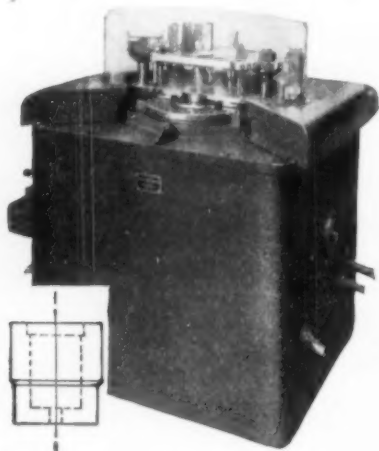
in the hands of experienced operators are establishing new records of performance—TEN, FIFTEEN, TWENTY THOUSAND carbide tools ground with one and the same Super-Cut Wheel! It will pay you to investigate NOW!

Industrial Abrasives
INC.

3724 W. 38th St., Dept 6-B, Chicago 32, Illinois

mensions of all production parts individually at no greater cost than spot-check inspection.

The machine, designated as "Check-matic" provides automatic inspection



Automatic Inspection Unit

of parts up to 1-1/2" in diameter and 2" in height, and checks "go" and "no-go" on such dimensions as outside and inside diameters, depth of counter-bore, wall thickness, and depth of holes, all to limits of .001".

In operation, parts to be inspected are placed in holes on a revolving dial which carries them to various gauges for the series of inspection operations. Parts rejected at any particular inspection station are automatically segregated.

The machine has an 18-hole dial and is designed to check as many as 13 individual dimensions. It can be adapted quickly for inspection of parts of different shapes and dimensions.

HYDRAULIC UNIT COMBINES OPERATIONS (N88)

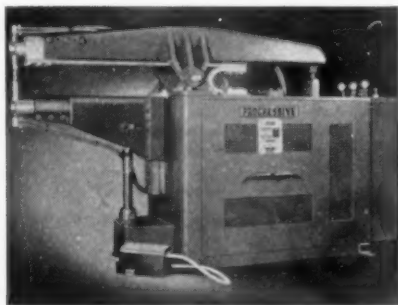
Barnes Drill Co. has developed a new special hydraulic production drilling unit that can be arranged for drilling, reaming, facing, boring, counter-boring or tapping operations in any one or combination of horizontal, vertical, or angular positions.

Used in a vertical position as a hydraulic production machine, the unit will perform simultaneous drilling, reaming, and counterboring operations. It also can be arranged vertically in combination with angular and horizontal applications. According to the company, vertical arrangements of the unit around a rotating indexing table will result in saving in machining and handling time by combining several operations.

Each unit has a flange support for mounting interchangeable auxiliary heads of any desired number and arrangements of spindles. They are available in three sizes designated as Nos. 5, 10, and 20, and can be equipped with motors ranging in size from 5 to 7-1/2 hp, 10 to 15 hp, and 20 to 25 hp respectively. Maximum continuous production can be obtained by use of an automatic indexing table with a spare loading station and a hydraulic decelerated control for positioning the table.

WELDER FEATURES MINIMUM DEFLECTION (N89)

Designed for production up to 1000 to 2000 spot welds per hour when welding heavy sections, a rocker arm welder, designated as model "C", has been announced by Progressive Welder Co. Although rated at a maximum pres-



Rocker Arm Welder

sure of 6500 lbs. (at 90 lbs. factory air line) the welder holds deflections even under such conditions to a minimum, the company states. Deflections are thrown into the vertical plane, improving the weld by providing a "spring follow-up" during the weld.

Throat depth of the machine is ad-

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justable from 36" to 42", and throat opening from 7 1/2" to 15". The rocker arm is provided with a retracting stroke which provides a 1/2" clearance between points to permit insertion of flanged work.

Upper and lower arms are designed to handle standard electrodes and holders for refrigerated welding points. Electrodes may be mounted either vertically or at a 22 1/2° angle.

COLLET CHUCK DESIGNED FOR UNIVERSAL USE (N90)

Said by the manufacturer to provide larger capacities than anything of its kind heretofore obtainable, a new line of collet chucks has been introduced by United Industries.

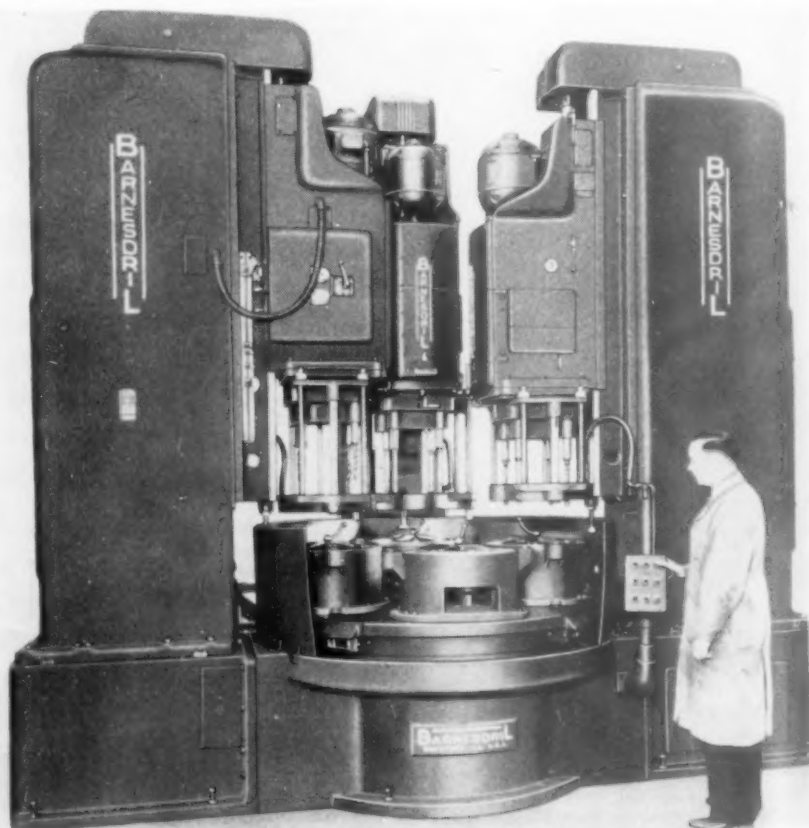
Designed in sizes for any size or make of machine, the chuck is adaptable to any operation requiring the use of a chuck, such as lathes, screw machines, and grinders. The collet is actuated by hardened steel balls, producing a powerful gripping action which insures against all possibility of stock slippage, according to the manufacturer. Four standard sizes—3/4", 1", 1-3/4", and 2-3/4" round, are available with special larger sizes obtainable on order.

ADAPTER DEVELOPED FOR SCREW MACHINE TOOLS (N91)

A new adapter for screw-machine tools, said by the manufacturer to double the capacity of screw machines, has been introduced by Boyar-Schultz Corporation.

The tool is designed to permit the use of more than one size tool on any

(Continued on page 168)



Special Hydraulic Production Drilling Unit Performs Varied Operations



No. 9 in a Series

DETROIT

Announces

**IMPROVED
LIGHT
DUTY
TAPPING
MACHINES**

**with even
greater
accuracy**

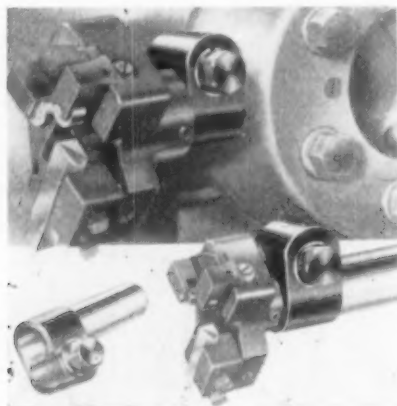


Ask for Bulletin
No. LTM-44

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STAMPS**

DETROIT
TAP & TOOL CO.

8432 BUTLER
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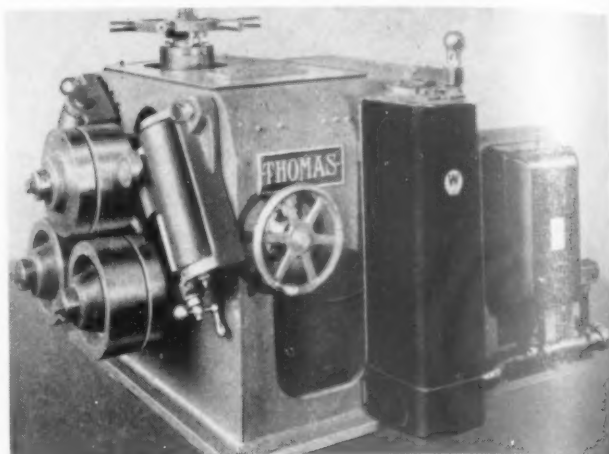
Screw Machine Adapter

single-size screw machine. Precision made of high quality tool steel, hardened and ground to assure correct fit, the adapters are available in four sizes— $\frac{5}{8}$ " to $\frac{3}{4}$ " short; $\frac{5}{8}$ " to $\frac{3}{4}$ " long; $\frac{5}{8}$ " to 1", and $\frac{3}{4}$ " to 1". Larger sizes will be available in the near future.

**BENDING MACHINE ROLLS (N92)
VARIETY OF SHAPES**

Thomas Machine Manufacturing Co., announces a new line of bending rolls, built of electrically welded rolled-steel plate, and capable of rolling angles, tees, flats, rounds, squares, pipe, beams, channels, and special shapes of almost unlimited variety.

Right:
Thomas Roll
Bending
Machine
For Rolling
Special Shapes



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According to the company, arcs, spirals, or circles can be formed on the machines. The units are available in four sizes, comprising rolls for bending angles 2" x 2", 3" x 3", and 4" x 4", in the vertical type machine, and for bending angles up to 6" x 6" in the horizontal type. An adjustable auxiliary roller counteracts twisting and

keeps the leg of the angle square when rolled leg in. The roller serves as a gage to indicate when the proper diameter is rolled when angles are rolled leg out. It also can be used for enlarging circles which have been rolled too small.

**OVERARM DEVELOPED (N93)
FOR MILLING MACHINES**

Benchmark Manufacturing Co., states that it has developed a removable overarm that will greatly increase the versatility of combination, horizontal, and vertical milling machines.

The overarm, which consists of three parts, makes possible the use of (Continued on page 170)

SWARTZ TOOL PRODUCTS Co., Inc.



13330 Foley Ave.
Detroit, Michigan

DESIGNERS BUILDERS

EQUIPPED TO HANDLE
ANY OF YOUR TOOLING
REQUIREMENTS

A larger special fixture — four parts are clamped with one lever motion and machined from both sides by the two-way heads.

ASK FOR CATALOG 941

Represented by

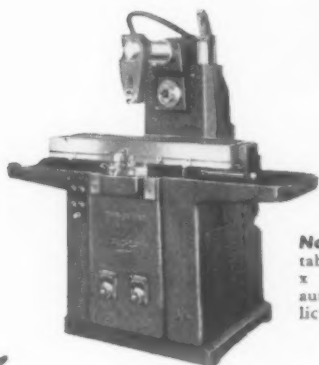
Cleveland—J. W. Mull, Jr.
Indianapolis—J. W. Mull, Jr.
Milwaukee—Geo. M. Wolff, Inc.
Chicago—Ernie Johnson

Canada—Hi-Speed Tools, Ltd., Galt, Ont.
St. Louis—Mill Supply & Mach. Co.
Beverly Hills, Cal.—Production Tool Engineering
Houston—Engineering Sales Co.

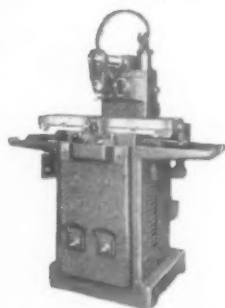
Oneida, N. Y.—W. F. Himmelsbach
Pittsburgh—J. W. Mull, Jr.
Toledo—J. W. Mull, Jr.
Philadelphia, Pa.—Morgan Tool
& Equipment Co.

Call on **KENT-OWENS** for Milling Machines

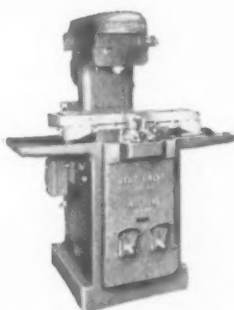
*Rugged...
Simple...
Efficient...*



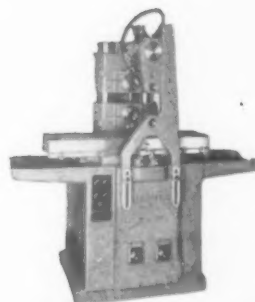
No. 2-20... 20" table travel... 42" x 12" table... full automatic hydraulic table feed.



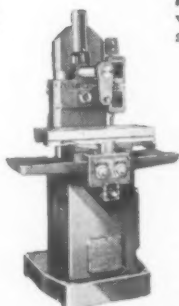
No. 1-14... 32" x 9" table... 14" table travel... hydraulic table feed... full automatic cycle.



No. 1-14V... 14" table travel with full automatic cycle... spindle speed range 115 to 3000 R. P. M.



No. 2-20DS... Double Spindle Machine for performing two milling operations at same time... 20" table travel... 42" x 12" table.



No. 1-V... Hydraulic vertical head feed... 5 1/2" head travel... 25" x 9" table.

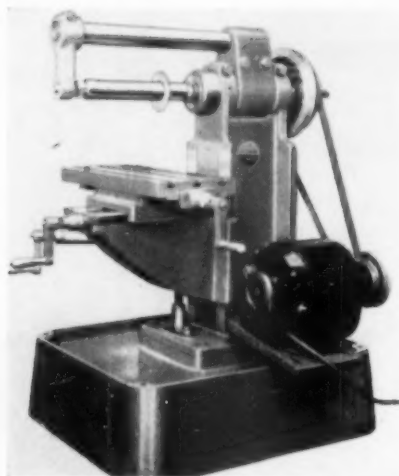


No. 1-M... Hand feed to table and head... 25" x 9" table... 1 H. P.... head counterbalance is adjustable.

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON General Machinery Corp.	DETROIT A. C. Haberkorn Mach'y Co.	LOS ANGELES Eccles & Davies Mach'y Co.	NEW ORLEANS Oliver H. Van Horn Co., Inc.	SEATTLE Star Machinery Company
BUFFALO Don W. Patterson	GRAND RAPIDS Joseph Monahan	MILWAUKEE Neff, Kohlbusch & Bissell	NEW YORK Wilson Brown Company	ST. LOUIS Blackman & Nuetzel Mach'y Co.
CHICAGO Neff, Kohlbusch & Bissell	HOUSTON Oliver H. Van Horn Co., Inc.	MINNEAPOLIS The Sarterlee Company	PHILADELPHIA Calco Machinery Company	SYRACUSE J. F. Owens Mach'y Company
DALLAS Hamilton-Huster Mach'y Co.	INDIANAPOLIS Oatis-Booth Machinery Co.	MOLINE John J. Normoyle Co.	PITTSBURGH Barney Machinery Company	TORONTO F. F. Barber Mach'y Company
DAYTON Gosiger Mach'y Company	KANSAS CITY Eichman Machinery Co.	MONTREAL F. F. Barber Mach'y Co.	ROCHESTER F. W. Schiefer Machinery Co.	WALKERVILLE F. F. Barber Mach'y Company
			SAN FRANCISCO C. F. Bulotti Machinery Co.	

KENT-OWENS MACHINE CO., TOLEDO, OHIO



Milling Machine Overarm

a regular milling machine arbor in a horizontal mill. It is mounted by removing the driving pulley from the rear of the horizontal spindle and slipping out the spindle itself by releasing two accessible screws. The overarm

INFORMATION FREE

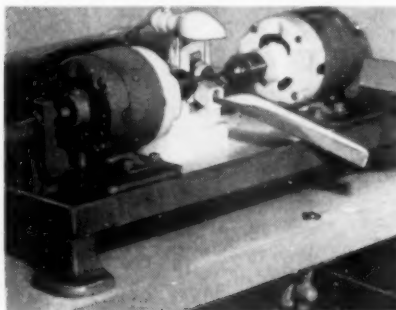
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

is easily attached to the machine through a heavy semi-steel casting mounted on the horizontal spindle, providing extra rigidity for arbors, boring bars, and special tools.

LOWER COSTS CLAIMED FOR COUNTERSINKER (N94)

Greatly increased production and considerable savings in labor costs are principal advantages cited by Mercury Products Co. for its new countersinking machine.

Simplicity of construction is a principal feature of the machine, since it has only two rotating members and no belts to wear out. Other features cited by the manufacturer are No. 8½ Jacobs chucks, heavy tool post, optional knee control or floor pedal, tool post micromatic adjustment for depth

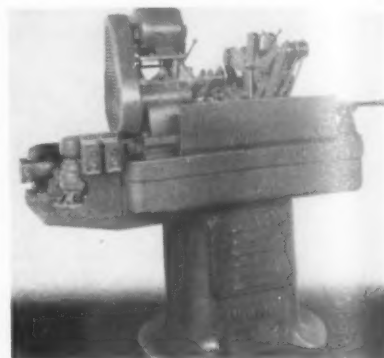


Countersinking Machine

and height, and end micrometer adjustment for depth of countersinking. The machine occupies one-third the bench space usually required, according to the company.

LAPPER ADAPTABLE TO CURVED SURFACES (N95)

A new lapping machine, capable of producing surface finishes as low as



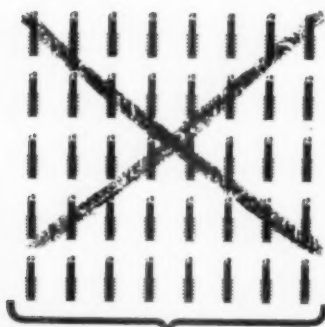
Norton Lapping Machine

one micrometer RMS and designed for simultaneous finish operations on one or several cylindrical finishes, has been introduced by Norton Company.

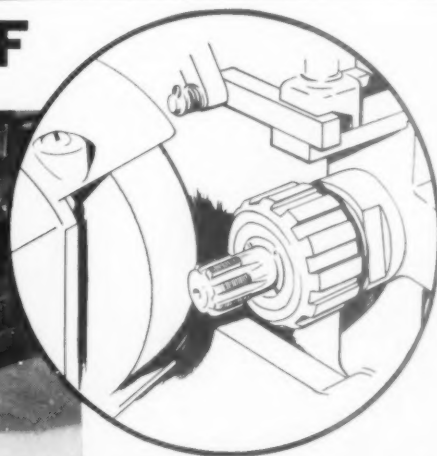
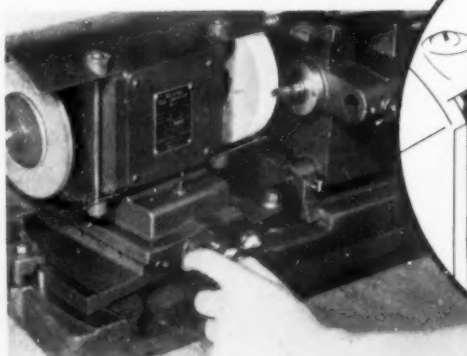
One bearing or several on a work piece can be finished in a fraction of a minute, the company states. The machine is designed for versatile and quick-change operation and will handle

(Continued on page 172)

WHY BUY FORTY TAPS IF



EIGHT WILL DO?



EDWARD BLAKE CO.

Please send me Bulletin 5A, which gives complete details on the Blake Tap Grinder.

NAME..... TITLE.....

COMPANY.....

STREET.....

CITY..... STATE..... T.E.

634 COMMONWEALTH AVENUE
NEWTON CENTRE 59, MASS.

SHARPEN THEM ON THE BLAKE

... And that's conservative, because Blake Tap Grinder users report "tap life increased ten times" ... "saved \$30,000 worth of taps in one year, on one machine" ... "haven't bought a new tap since we bought the Blake" ... "Paid for itself in less than 3 months".

You can reduce tap inventory, you can increase tap life, you can increase accuracy and production by sharpening the chamfer on right- or left-hand taps with 2, 3, 4, 5, 6, 8 and 10 flutes on a Blake Tap Grinder. There are two machine sizes which are described fully in Bulletin No. 5A. Send for your copy today.

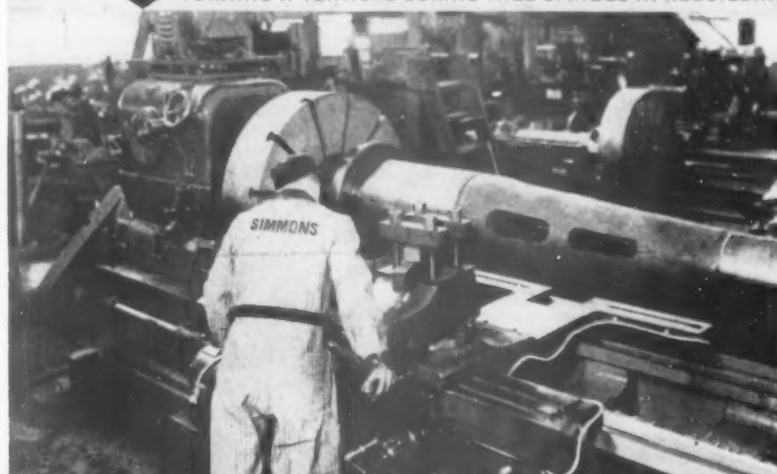
BLAKE TAP GRINDERS—L & D HIGH SPEED DRILL PRESSES—WALTHAM CUTTER SHARPENERS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS



**STEP UP
YOUR
VICTORY
PACE—
PREPARE
FOR
PEACETIME
PRODUCTION**



A 30 YEAR OLD GUN-BORING LATHE IS PRESSURE-CLEANED
TURNING A VERTICAL BORING MILL SPINDLE IN REBUILDING



REBUILD

YOUR MACHINE TOOLS

Now!

IN THE

WORLD'S LARGEST PLANT DEVOTED TO MACHINE TOOL REBUILDING

In recent years, many of your machine tools have undergone punishing wear and tear. Operated the clock around, often in semi-skilled hands and with a minimum of maintenance, they are probably on the "ragged edge." Now is the time to return them to peak efficiency, stepping up your Victory pace and preparing for peacetime manufacture.

Machine tool reconditioning is a science at Simmons. *Engineered Rebuilding*, the solution to maintenance problems, accords each machine the following treatment: It is completely dismantled to the main castings and pressure-cleaned. All worn or broken parts that affect the operation of the machine are renewed. Sliding surfaces are renewed and ground or scraped, as required. Worn shafts or bearings are replaced or re-surfaced, as required. It is re-assembled along the lines followed by the original manufacturer and tested under power before your inspector.

During the last thirty-five years, Simmons engineers and mechanics have dismantled and rebuilt every type of machine tool manufactured. The largest and heaviest of equipment can be handled comfortably in our two spacious, modern plants. That's why the world's largest leading industries call Simmons "Rebuilding Headquarters."

Consult Us Today Without Obligation

SIMMONS MACHINE TOOL CORP.
1810 North Broadway, Albany 1, N. Y.

SIMMONS
ENGINEERED
Machine Tool
REBUILDING

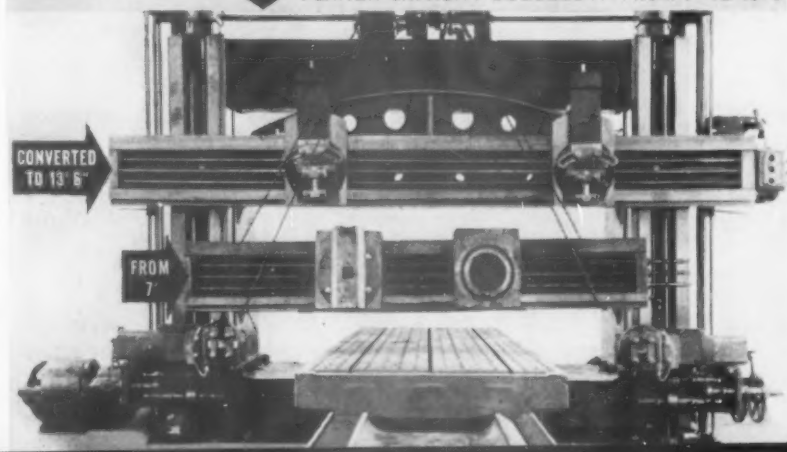


PLANING LATHE BEDS



MAKING FINAL ADJUSTMENTS

PLANER CAPACITY DOUBLED... FROM 7' TO 13' 6"



eccentric or concentric cylindrical portions at the same time as well as such sections as the pins of short-throw cranks on compressors, the journals and eccentric members of small camshafts. The lapper has a capacity from 1/2" to 2" on diameters with lengths up to 24".

THREE-BLADE ADJUSTABLE HOLE CUTTER ANNOUNCED (IN96)

Said by the manufacturer, The Robert H. Clark Co., to produce accurate, clean holes, that require no after-grinding, reaming, or filing, a new set of three adjustable hole cutters has been placed on the market.

Designed with straight shanks for



Adjustable-Hole Cutter

use as hand tools, in portable electric and pneumatic drills, and in light drill presses, the cutters will handle all possible diameters from 5/8" to 3 1/2" on aluminum, Dural, steel, brass, wood, plastic, fibreboard, and many other materials.

Cutters are adjustable and can be easily sharpened by any competent mechanic. They also may be used with lathes and other spindle-type machines. The tool consists of a straight shank on a hexagon body into which are set three high-speed-steel blades at 120° intervals. The company states that the balance provided by the special 3-blade design makes it possible to cut holes in curved or irregular surfaces such as pipe or tubing. The hardened and ground pilots on the larger sized tools are removable and may be replaced with lead drills if desired.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

STANDARD STOCK BASES AID MOLD MAKERS (IN97)

Notable savings in time and effort are said to be effected by use of a new line of standard stock bases for injection molding developed by Detroit Mold Engineering Co.



Standard Mold Base

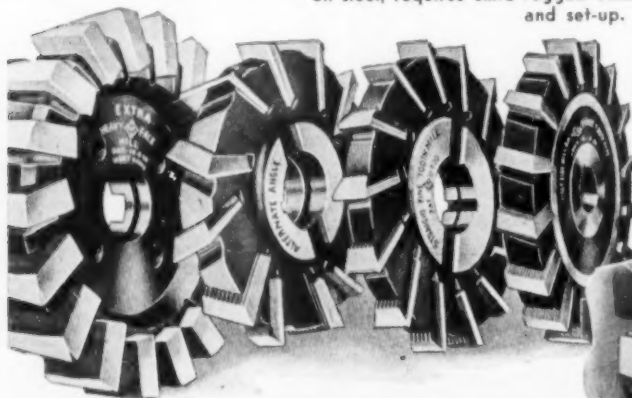
According to the company, the development permits considerable time saving, permits immediate work on cavities, and eliminates the extensive work of machining bolster plates, knockout plates, and gate and dowel pin mechanisms.

Designed to supply the mold maker with as many pre-fabricated mold parts as possible, the sets are furnished in complete units ready for incorporation of the cavity. Included in the unit are locating ring, sprue bushing, front clamping plate, front cavity plate, rear cavity plate, support plate, spacer block, ejector retainer plate, sprue puller, return pin, ejector plate, (Continued on page 174)

NEGATIVE RAKE & SPIRAL MILLING CUTTERS FOR MACHINING STEEL AT HIGH SPEEDS

The O K Tool Co. not only originated Inserted-Blade Milling Cutters but also pioneered the successful adaptation of these cutters to negative rake and spiral milling.

This type of milling, a "shearing" cut from rear to point of blade which leaves a high finish on steel, requires extra rugged construction both in cutter and set-up. Extreme strength and rigidity are outstanding characteristics of O K Inserted-Blade Milling Cutters, due to the very high grade material and to the effective locking mechanisms employed.



In O K Milling Cutters, the blades are separate cutting units; the bodies are of drop-forged steel. The blades are held securely in mating serrations—always easy to adjust or renew. No pins, no set-screws, no wedges. Made in a wide variety of styles and sizes for all types of metal cutting machines.



O K Tools Are Available for Every Metal Cutting Need

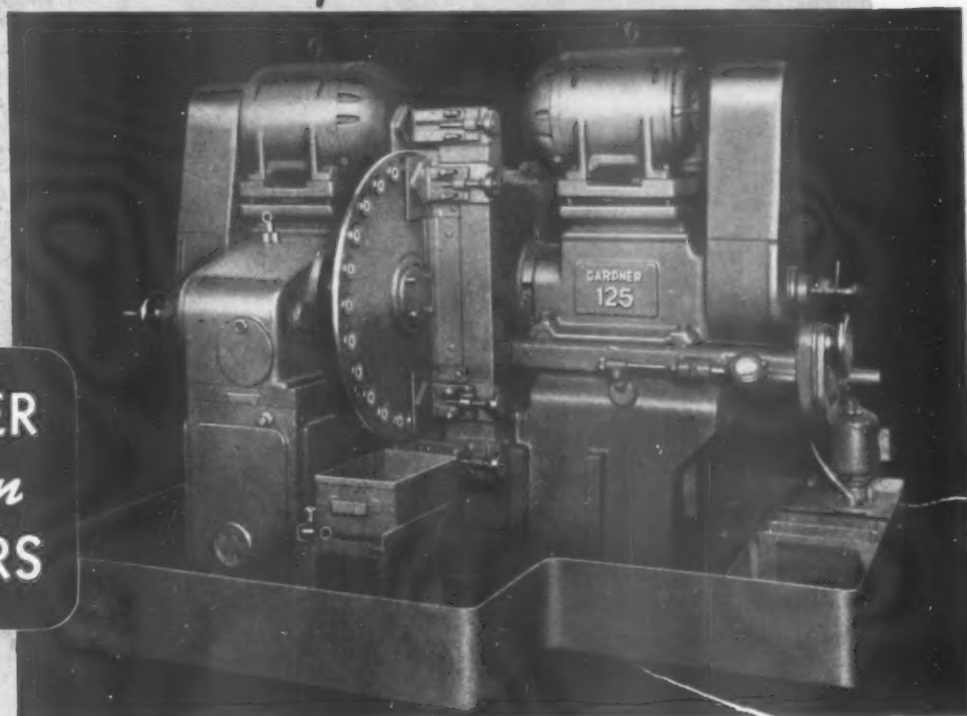


SYSTEM
OF INSERTED-BLADE METAL CUTTING TOOLS

THE O K TOOL CO., SHELTON, CONN.

Get PRODUCTION *plus* ACCURACY

GARDNER
Precision
GRINDERS



with this
GARDNER *Precision* **GRINDER**

HIGH production—close accuracies—you definitely can get BOTH, on such of your parallel-surface parts as are adapted to Gardner DOUBLE Grinding!

Several models of Gardner PRECISION Grinders, in sizes ranging from 15" up to 30" wheels, are available for dozens of jobs which were formerly ground one side at a time, on the conventional Surface Grinder.

PROOF? Certainly! Ample proof, in the form of many actual installations, one of which is shown here.

This No. 125-23" machine grinds bearing races, $1\frac{7}{8}" \times 1\frac{7}{8}"$, AT THE RATE OF 30 TO 40 PIECES PER MINUTE, using a rotary work carrier. Stock removal averages .008" to .010" overall, and tolerances of .0003" to .0005" for squareness and parallelism, and .003" for uniformity, are maintained.

Investigate the possibilities of this method—
Ask for data on GARDNER Double GRINDING!

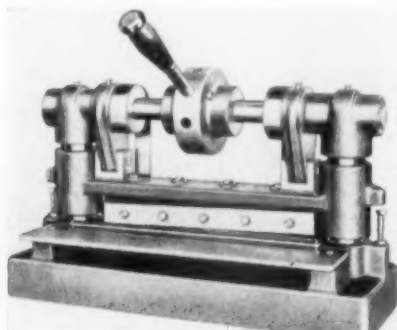


GARDNER MACHINE COMPANY
442 East Gardner Street , , , Beloit, Wisconsin, U.S.A.

rear clamping plate, and stop pin. All surfaces of the cavity retainer plates are ground and corners are square so that laying out and checking can be done from the edge of the plates.

**SHEARING MACHINE (N98)
HAS WIDE RANGE**

A new shearing machine, designated as Di-Acro No. 3 and incorporating changes and improvements obtained



Metal Shearing Machine

from nine different previous production models, has been introduced by O'Neil-Irwin Mfg. Co.

Features of the machine cited by the manufacturer are precision adjustment for accurately stopping blade travel, permitting a large variety of slitting and notching to extremely close tolerances; a metal-stripping guide for stripping all types of material within

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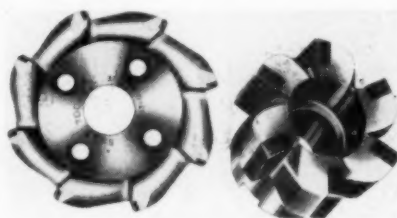
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

the capacity of the shear to extremely narrow widths; a built-in delivery chute to deliver all materials, fabrics, and tissues at any speed within the ability of the operator to feed the shear; and full adjustment for tolerances on both shear blades as well as control of angularity of pitch which can be varied as desired for shearing all types of materials.

**CARBIDE-TIPPED SHELL
END MILLS AVAILABLE (N99)**

Super Tool Co. announces a complete line of carbide-tipped shell end mills and face mills in all standard sizes.

According to the company, the mills are produced on a production basis



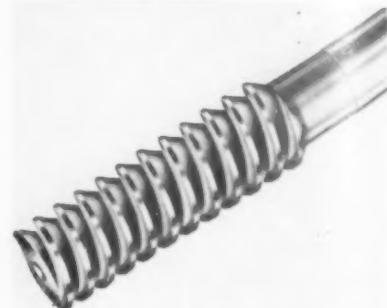
Carbide-Tipped Mills

providing carbide-tipped cutting efficiency at prices that compare favorably with other types of end mills and face mills.

**NEW ROTARY BROACH
MAKES CIRCULAR CUT (P1)**

A new tool, named "Rotary Broach", has been announced by the Shearcut Tool Co.

The manufacturer states that the



New Broaching Tool

tool is in effect a broach that rotates as it cuts and that it removes metal by a knife-like action, the chips resembling steel wool in form and texture. The company states further that because the cutting edge is in the form of a circle, there is no tendency to produce elliptical or uneven holes.

(Continued on page 176)

In a complete range of sizes from 1/4" to 6" diameter. Available from stock in right hand cut with right hand spiral, or left hand cut with left hand spiral.

Heavy Duty SHELL END MILLS

Are Now Standard Putnam Tools

A new addition to the line of standard Putnam Hi-Speed cutting tools! Correctly designed and made of the finest high speed steels, these heavy duty shell end mills offer the same fast-cutting, long-lasting qualities typical of all Putnam tools. They are carried in stock—immediately available to increase the efficiency of your milling operations. Let us send you full information.

OUR CATALOG IS
OUR STOCK LIST

ONE PIECE
ELECTRIC STEEL
CASTING

FOR AIR
OR HYDRAULIC
OPERATION

"LOGAN" Chucks

REACTION TO CLAMPING FORCE
TENDING TO SPREAD CHUCK BODY.
RESISTED BY ONE PIECE STEEL
BODY, UNINTERRUPTED SIDE WALL
AND RADIAL RIBS

TANGENTIAL DRIVING
FORCE TRANSMITTED
TO JAWS THRU SOLID
STEEL BODY

STRESS DUE TO ATTACHMENT
BOLTS DIRECT ON MOUNTING
FLANGE OF SPINDLE - NO INTER-
MEDIATE PIECES.

"LOGAN" JAW OPERATING LEVERS

● Built of chrome nickel steel,
drop forged and heat treated.
Designed to deliver maximum
jaw pressures.

MAXIMUM JAW PRESSURE AND LASTING CHUCKING ACCURACY

"Logan" American Standard Chuck bodies are one-piece electric steel castings, cored for light weight and correct balance. Radial reinforcing ribs at all stress points provide an ample margin of strength and rigidity. This compact body design reduces spindle overhang and thereby lessens vibration and strain on the machine spindle. Special heat treated steels are used in all working parts. All bearing surfaces are precision ground to insure maximum operating efficiency. All operating parts are protected by positive pressure lubrication.

"Logan" manufactures a complete line of standard and special types of chucks and work-holding devices; also the actuating and control equipment for air or hydraulic operation. Write for Catalog 70, Sec. 1.

LOGANSPOUT MACHINE COMPANY, INC.

902 Payson Road, Logansport, Indiana

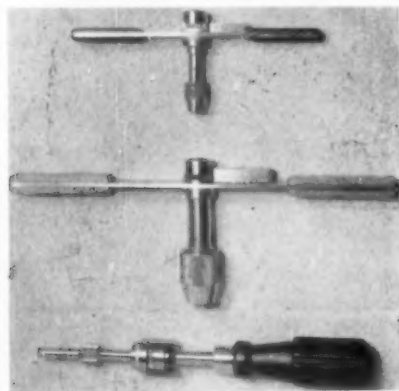
"LOGAN" Air and Hydraulic Equipment

CHUCKS ★ CYLINDERS ★ VALVES ★ PRESSES ★ SURE FLOW COOLANT PUMPS

The broaches may be sharpened from five to 30 times before they wear undersize, the manufacturer states, and may be used in any machine to take the place of a reamer. The tools are available with straight shanks only in sizes $\frac{1}{4}$ " to 1" by sixteenths and from $1\frac{1}{8}$ " to $1\frac{1}{2}$ " by eighths. Larger sizes up to 6" can be supplied on special order.

**TORQUE TOOLS DESIGNED (P2)
FOR PRODUCTION WORK**

Zimmerman Products Engineering has introduced a line of torque tools developed for continuous use in production and assembly lines for service work.



Torque Tools

INFORMATION FREE

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According to the company, no attention is required after the tools are once set to torque desired, they do not require lubrication and are unaffected by oil or grease. The tools are especially desirable in tapping, as they can be adjusted to slip at slightly more than the torque required for tapping but considerably less than that required to break the tap.

The company states that the use of its torque wrenches make it impossible to over-tighten a bolt or screw because when the torque at which the tool is set is reached, additional turning of the tool will not tighten the bolts any further. Screwdrivers have interchangeable tips to suit any type screw.

**FACE MILLING CUTTER (P3)
TAKES HEAVY CUT**

Lovejoy Tool Co., Inc., has designed a new heavy-duty face milling cutter incorporating blades 1" in diameter and capable of taking cuts up to $\frac{3}{4}$ ".

Designated as Type "H", the mill is furnished in diameters 6" to 8" inclusive for shell-end arbor mounting, and diameters 9" and larger for spindle mounting. The cutters are available



Lovejoy Milling Cutter

with negative cutting angles. The 1" diameter blades provide rigid support for the carbide tips for this type of application.

**PORTABLE TESTER CHECKS (P4)
VARIETY OF SPECIMENS**

W. C. Dillon & Co., Inc., announces that its new light-weight, compact, portable tensile tester can be operated by inexperienced help and will apply tension up to 10,000 lbs.

According to the company, the tester is not injured by accidental overload and is fully protected by an automatic shock absorber. Tension is applied by means of a counter-balanced hand wheel and smooth gearing. The material (Continued on page 178)

Send for Valuable Booklet

Forgings For All Industries
Rough Turned or Finished Complete



•
Composite Die
Sections
Extrusion Tools
Crankshaft Forgings
Gear Forgings
Die Casting Dies
•

Rings, Discs, Blocks,
Shafts, Hubs, Bars,
and Special Shapes.
Tool Steel Forgings

S.A.E. and N.E.
SPECIFICATIONS

Stainless &
Copper Forgings

May we Serve You?

AJAX STEEL & FORGE Co.

205 ADAIR STREET

DETROIT, MICHIGAN

IMPRESSIVE IMPRESSIONS!



...with Matthews "S-22"

ACID ETCHING STAMPS

Four to five times as many impressions as ordinary rubber or other synthetic stamps, is quite impressive among inspectors in industrial plants, who use Matthews "S-22" Stamps for marking parts by means of acid etching. May we send you full information and prices? If so...

Write for Bulletin "S" Today!

JAS. H. MATTHEWS & CO.

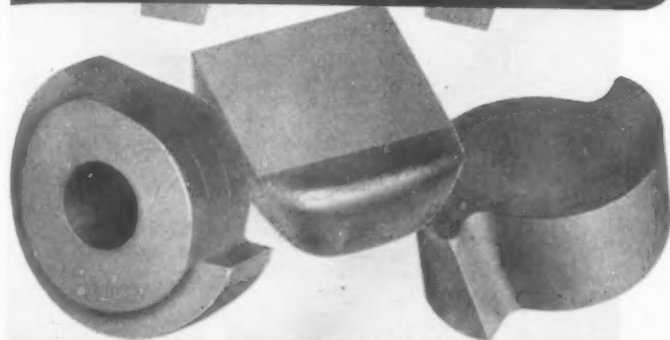


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Branch Plants
New York, Boston, Chicago, Philadelphia, Newark, Syracuse
District Sales Offices
Cleveland Detroit Hartford Birmingham

Better, Longer-Life Tools

WITH MEEHANITE



THE Cooper-Bessemer

CORPORATION

DEPT. E., MOUNT VERNON, OHIO

YES, cutting tools are weapons, too . . . so treat 'em right. If they can perform better and longer, then America's machines can deliver on time the goods that war's climax demands.

Cutting tools *can* perform better and last longer—even in the hands of less experienced workers—when they are Cooper-Bessemer-made of Meehanite, tipped with cemented carbide. Meehanite tool shanks, forming tools, milling cutters and many special purpose tools give you numerous unique advantages—greater vibration damping capacity, less loading in operation, easier and less machining before tipping, and lower cost.

Hundreds of shops are using these Cooper-Bessemer tools today. They are available promptly, ideal for any plant equipped to tip its own tools.

Samples furnished upon request, so you can judge their value by performance in your own plant. Ask also for our Bulletin 53-T-2.





Says a representative
tool maker about his
"AMERICAN SWISS" Swiss-Pattern Files:

"... save 30% on file costs"

This statement is particularly definite, because it was made after the manufacturer had been using "American Swiss" Files constantly for 12 years.

These precision tools produce impressive savings in filing operations because of the way they are made. All "American Swiss" Swiss-Pattern Files are of the highest grade file steel—not tool steel. They are formed closely to size—with tolerance of $\pm .002$ - in. in some shapes; and are heat treated with automatic control and regulation to within $\pm 5^\circ\text{F}$. in order to assure uniform hardness. There are no "second quality" American-Swiss files . . . every one you buy is guaranteed to be perfect in every respect.

The large "American Swiss" line of more than 3000 different shapes, cuts and sizes assures an exactly suitable selection for every precision and intricate filing job . . . our distributor will be glad to supply you.



**FREE
CATALOG
SENT ON
REQUEST**

American Swiss File & Tool Co., Elizabeth, N. J.

ASK FOR THEM BY NAME
American Swiss ★ ★ ★
SWISS PATTERN FILES

—NEW EQUIPMENT—



Portable Testing Machine

chine can be used for compression testing by equipping it with a compression gage. It will handle a variety of specimens, including wood, springs, plastics, and similar jobs.

The tester also can be used for transverse testing on porcelain, bakelite, glass, and similar specimens. Test work is placed on the knife edges of breaker arms and pressure is exerted downward by a center knife edge. Also, the unit may be motorized for jobs that require tensions to be applied with a definite rate of speed or inches travel per minute.

INFORMATION FREE

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**MIDGET SNAP GAGES
CHECK SMALL PARTS**

(P5)

Four models of adjustable-limit, midget-type snap gages, have been announced by the George Scherr Co.

Manufactured in accordance with American Gage Design Standards, and designed for checking and inspecting extremely small and delicate parts, the gages can be set to handle work from .000" to .760".



Scherr Midget Gages

**NEW HOIST ADAPTABLE
TO VARIOUS MOUNTINGS**

(P6)

Quick interchangeability to bolt, hook, or trolley mounting, with change
(Continued on page 180)

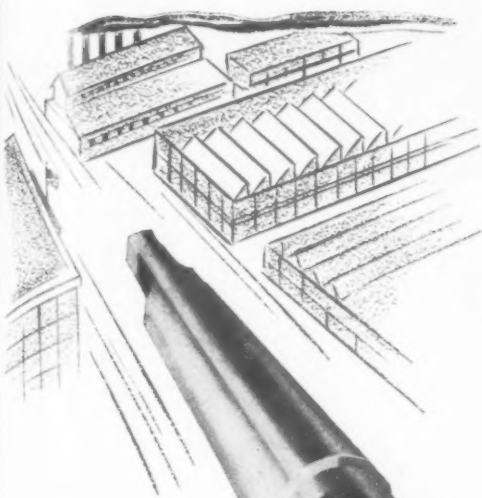
Out of VITAL PRODUCTION PROBLEMS

CAME THIS NEW IMPROVED

PATENTED DUAL-SPIRAL

EXPANSION REAMER

It took this Hi-Speed Steel Expansion Reamer to break the bottleneck on tailfork production in a Mosquito bomber plant, and to ream accurate smooth holes on grooved surfaces in an automatic rifle factory. Other reamers didn't do these jobs — satisfactorily. Two blade segments spiral in a direction opposite to that of the third and shear a mirror-smooth finish on any machinable metal or plastic. Reams accurately, rapidly — easily.



- ★ Adjustable for Size Instantaneously on the Job!
- ★ Makes Clean Holes.
- ★ Eliminates Costly Wear on Plug Gauges caused by Abrasive Left in Honed Holes.
- ★ Removable Blades are Easy to Resharpen.
- ★ Extension Pilots for Alignment Jobs.
- ★ .050" to .080" Straight Line Expansion*
- ★ Reams Smoothly over Keyways and Split Bushings.

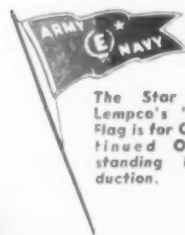
*Sizes under 11/16" slightly less.

WRITE FOR CATALOG

LEMPCO

5761 DUNHAM RD. • BEDFORD, OHIO, U. S. A.

JUNE, 1944



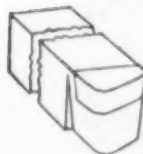
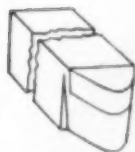
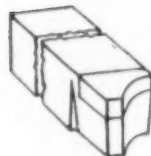
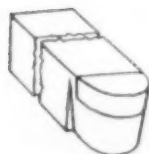
The Star on Lempco's "E" Flag is for Continued Outstanding Production.



LET US CUSTOM-TAILOR Your KENNAMETAL-TIPPED TOOLS FOR SPECIAL PURPOSES



...and you'll be sure of a perfect fit



Fitting a carbide tool to the work is a job for specialists—and the skill with which the tool is ground is directly reflected in increased production. Kennametal standard tools will handle the majority of usual metal-cutting jobs, but even if their number were multiplied by ten, there still wouldn't be a sufficient variety. For the tool must be fitted to the work, not the work to the tool.

Our personnel is trained in the art of properly grinding Kennametal-tipped tools. A modified standard tool design produced by us gives the same high performance as a standard tool. There are no thinned-out carbide tip dimensions caused by cutting to required angles. There are no minute accordion cracks resulting from excessive heat generated by "bearing down" to hasten the grinding process.

When we supply the complete tool a simple modification often will cost less than the abrasive wheel alone that would be used up in modifying a standard tool. Even the more complicated modifications can be produced by us more cheaply, for a revision that requires hours of grinding in your shop, takes only minutes in ours. When you need modified standards call on our nearest Field Engineer. Or . . . send us drawing, sketch or blue print with angles and sizes shown. Specify grade of Kennametal or describe work. For complete instructions see our new Tool Manual. Write for a copy of it today.



KENNAMETAL Inc., 600 LLOYD AVE., LATROBE, PA.

—NEW EQUIPMENT—



Electric Chain Hoist

over requiring the loosening of only one bolt, is said by Harnischfeger Corporation to be a principal feature of its new low cost electric chain hoist.

Other features cited by the manufacturer are fully enclosed construction, 500 lbs. capacity with unusually high reserve, lifting chain proof-tested for 1800 lbs., one-hand operation through a pull cord, a safety limit stop to prevent over-travel of hook at both upper and lower limits, dual braking which automatically releases when hoist is operated and sets instantly with current shut-off.

INFORMATION FREE

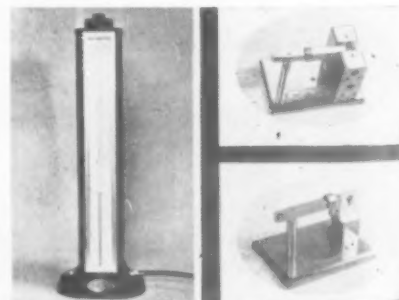
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

AIR GAGE PROVIDES CONTINUOUS INSPECTION

(P7)

A new air gage for measurement of slots and thicknesses to readings of .000025" has been developed by Metrical Laboratories, Inc.

The principal advantage cited by the manufacturer is that the gages are not influenced by wear and consequently no wear allowance has to be made. Also, resulting measurements are the same, regardless of the skill of the operator. Another factor pointed out by the company is that the gaging process is accelerated considerably because of the continuous procedure achieved by feeding the parts over a rail past the measuring orifices. THE END



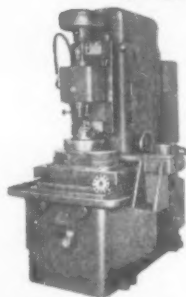
New Air Gage

THE TOOL ENGINEER

**THINKING ABOUT
THOSE POST-WAR
PRICE TAGS?**



Now is the time to talk to **SNYDER** about ways
and means to control **PRODUCTION COSTS!**



SNYDER KNOWS HOW

This special-purpose automatic cycle machine, designed and built by Snyder, mills three pairs of slots, each slot connecting two holes, in a gear flange.

Two-spindle head with ball-bearing mounted spindles advances rapidly toward work which reciprocates slowly through an arc the length of the slot. Hydraulic feed moves the tools into the work in small steps of .010" to .060" per reciprocation of the part. As each pair of slots is cut, tools retract rapidly, hydraulic feed is automatically reset and the fixture is indexed 60 degrees, bringing the flange into position for the next cycle. Index drive is through splined shaft and worm wheel. Reciprocation of main table is through rack and pinion by means of hydraulic cylinder plungers.

Figures on post-war price tags will be decided by figures on post-war production cost sheets—which in turn will be governed by the efficiency of production machines and of the workers who operate them.

The special-purpose machine offers positive and reliable means for controlling the various processing factors—speed, accuracy, finish, etc.—which govern cost. Designed to perform one or a series of operations which may be simple or complex, it operates upon an automatic time cycle, predetermined by your production objectives. Time is controlled.

Tolerances and finish likewise are predetermined and are maintained uniformly and automatically, minimizing the ratio of rejects and scrap. Quality is controlled.

Automatic operation, by reducing the factor of human skill prevents excessive tool cost. It also increases the safety factor.

Because of these advantages, the special-purpose machine will be a major factor in deciding the figures to be written upon post-war price tags.

The time to plan your machines for post-war production is NOW—while there is time to design and build them

BEFORE they are actually needed. Designed now, they can be built as soon as present restrictions are lifted, installed in your production line, ready to go when materials are made available.

By reason of its 20 years experience in designing and building special-purpose machines, the Snyder organization is particularly well qualified to help with your production problems—and is ready to consult with you on the initial steps NOW. We invite you to write in full confidence. Snyder Tool & Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Michigan.

PLAN Your PRODUCTION
when you
PLAN Your PRODUCT

SNYDER
DESIGNERS AND BUILDERS OF
SPECIAL-PURPOSE MACHINES
FOR HIGH PRODUCTION
AT LOW UNIT COST

20 Years of Successful Co-operation with Leading American Industries



SCREW MACHINE CAMS for B & S MACHINES

Cams cut to your layout shipped within 2 to 3 days.

Set of 3 No. 00 Cams including blanks, cutting, heat treating — \$6.20 complete. Other sizes in proportion.

GEORGE L. DETTERBECK CO.
1871 CLYBOURN AVENUE
CHICAGO, ILL.

WILLEY'S DIAMOND TOOLS



WILLEY'S Diamond Tools are back again. There's a complete line, with many new improvements.

WILLEY'S method permits the *complete* use of the diamond, or resetting if preferred, because the WILLEY'S Metal used for anchoring has machinable properties.



Setting diamonds in WILLEY'S Metal so greatly prolongs their life that small diamonds will now dress a wheel that formerly required large, expensive stones.

WRITE FOR CATALOG 41

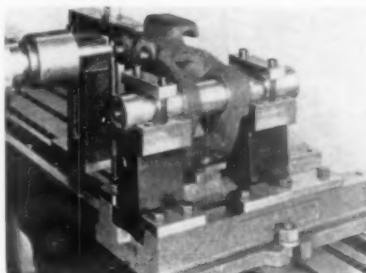
Gives complete information and prices of WILLEY'S Diamond Tools and mechanical dressers. Write today.

WILLEY'S CARBIDE TOOL CO.

1342 W. Vernor Highway

Detroit 1, Michigan

THE HARTFORD V-BLOCK FIXTURE



A NEW
ADAPTATION
OF AN OLD
PRINCIPLE

Illustration above shows a typical setup involving an irregular casting bored on a milling machine. The first hole is bored in the casting, then other holes are bored parallel to and in accurate relationship to the casting.

The Hartford V-Block Fixture provides a rapid accurate method of setting up work for milling, drilling, boring, and inspection and for locating and holding irregular shapes. Its ability to simplify and speed up the toughest setups makes it a worthwhile investment for any machine shop.

WRITE FOR LITERATURE

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

THE UTILITY SLEEVE Removable Taper Shank TOOL DRIVER

CUTS SMALL
TOOL COSTS

SIMPLE,
POWERFUL,
POSITIVE,
ACCURATE,



For:
TAPS
DRILLS
REAMERS
END MILLS
COUNTERSINKS
CENTER DRILLS
COUNTERBORES
WOODRUFF CUTTERS
TAPER PIN REAMERS, ETC.

THE J. C. GLENZER COMPANY

DETROIT

MICHIGAN

THE TOOL ENGINEER

IMMEDIATE DELIVERY

AUTOMATICS

Acme, 7/16" Model C, 5 spdl, M.D.
Cleveland, 1, 1 1/2, 2 1/2, 2 3/4 & 3 1/4" Model A
Cleveland, 7/8, 1 1/2 & 2 1/2" Model B
Cleveland, 1 1/4 & 1 1/2" 4 spdl, Model M
Cone, 1 1/4 & 1 1/2" 4 spdl, M.D.
Gridley, 2 1/4, 3 1/4 & 4 1/4" S.S.M.D.
Gridley, 9/16" Model G, M.D.
Gridley, 3/4, 1 1/4 & 2 1/4" Model F, M.D.
Potter & Johnston, No. 5A & 6A M.D.

GEAR MACHINERY

Barber-Colman No. 12 Hobbers
Fellows Shapers, No. 6 & No. 7 H.S.

GRINDERS

Blanchard No. 16A R.S. with 30 x 18" Magnetic
Chuck, 30 H.P. A.C. Motor
Landis 6 x 18 & 10 x 36" Landis Plain, M.D.
14 x 36" Norton Plain, M.D. type B81.
Webster & Perks, 10" x 30" Universal

LATHES

Putnam, 60" x 17" with 12" Riser Blocks
Warner & Swasey Turret No. 24 & 6, M.D.

MILLING MACHINES

Becker Vertical No. 3, 5B & 6—M.D.
Becker Vertical, Model SD, 40" Rotary Table

USED & REBUILT

MACHINE TOOLS

POWER PRESSES



546 Second Ave.

Detroit 26, Mich.

Phone: Cadillac 3103

DANLY

Precision

DOWEL PINS

All Die Makers'
Supplies

Danly Precision
Dowel Pins

Danly
Commercial
Sets

Danly
Special Sets

DANLY MACHINE SPECIALTIES, INC.
2100 S. 52nd Avenue, Chicago, Ill.

MILWAUKEE • LONG ISLAND CITY, N. Y.
DAYTON • DETROIT • ROCHESTER
CLEVELAND • PHILADELPHIA
Ducommun Metals & Supply Co.
Los Angeles • San Francisco

DANLY
PRECISION DIE
SETS

JUNE, 1944



Sand castings

These worm gears are typical products of the Ampco foundry. Precision heat treatment also available.

Precision-machined parts

Large, modern machine shop ready to finish castings when desired.



Centrifugal castings

Ampco pioneered in the centrifugal casting of aluminum bronze, offers long experience and special equipment.

Wrought products

Complete facilities, including extrusion mill for producing rods and bars.



Wear-resisting AMPCO METAL is available in all its forms from one completely equipped, dependable source

Let an Ampco Field Engineer give you the benefit of Ampco's 30 years of specialization in aluminum bronzes

Now standard for critical parts in nearly 100 makes of machine tools—in practically every American-built combat plane that flies—in ordnance, heavy machinery, and many another spot subject to wear, shock, fatigue, or corrosion—Ampco Metal is available in so many forms that it gives you great freedom of design for your post-war products. Investigate! Let an Ampco field engineer explain how you can provide parts that last several times as long as ordinary bronze—and give your customers that extra margin of safety that means genuine, lasting satisfaction. Write for bulletins.

A-3



Metal
The Metal without an Equal

Reg. U.S.
Pat. Off.



Coated Welding Electrodes

Five grades of Ampco-Trode, for metallic-arc, carbon-arc, or gas welding of practically any combination of metals.



Non-sparking safety tools

Industry's standard, where explosive fumes, gases, or dust are present.

TEAR OUT AND MAIL TODAY

Ampco Metal, Inc. Dept. TE-6
Milwaukee 4, Wis.

Please send catalog 23 and File 41 of Engineering Data Sheets.

Name _____ Position _____

Company _____

Address _____

City _____ () State _____

REID Hand Feed Surface Grinder No. 2C

Equipped with
Motorized
Spindle

Send for
Descriptive
Literature
EXCELLENT
DELIVERIES

**A Proven
Product for Over
a Quarter Century
with Thousands
in Use Daily**

Our dealers will help you
fill out necessary priority
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for your nearest dealer's
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Exclusive Selling Agents
H. LEACH MACHINERY CO.
387 CHARLES ST. PROVIDENCE, R. I.
Agents in all Principal Cities Throughout the World

"LOGAN"

SURE FLOW

Centrifugal

COOLANT PUMPS

For

MACHINE TOOL APPLICATIONS

*Write For
Catalog 61*

LOGANSPORT MACHINE, INCORPORATED
902 PAYSON ROAD LOGANSPORT, INDIANA
Manufacturers of Air & Hydraulic Devices, Checks, Cylinders, Valves, Presses, Accessories

Announcing **MEAD** **AIR COLLET** **FIXTURES**



These new high production precision fixtures open up new vistas in the field of second operation work. Their accuracy will meet the most rigid requirements; their fast action leaves nothing to be desired; their compactness does not waste a fractional inch. They will hold a 1" bar so firmly that a strong man cannot turn it with a 12" pipe wrench, yet in conjunction with a suitable pressure reducer they will gently handle the most delicate of precision parts as low as 1/16" in diameter. Automatic ejection of finished work. Write for new Mead Air Power Catalog.



**MEAD
SPECIALTIES
COMPANY**

15 SO. MARKET STREET
Dept. 64-TE — CHICAGO 6, U. S. A.

Distinct Advantages for You

—with Permanent Magnet Type Chucks

No Wires...
No Heating...
No Operating Costs...

Brown & Sharpe Mfg. Co.
Providence 1, R. I., U. S. A.

For sale only in the United States
of America and its Territories and
in Canada.

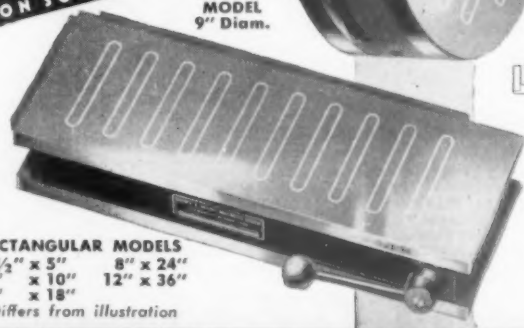
**PROMPT
DELIVERIES
ON SOME SIZES**

ROTARY
MODEL
9" Diam.

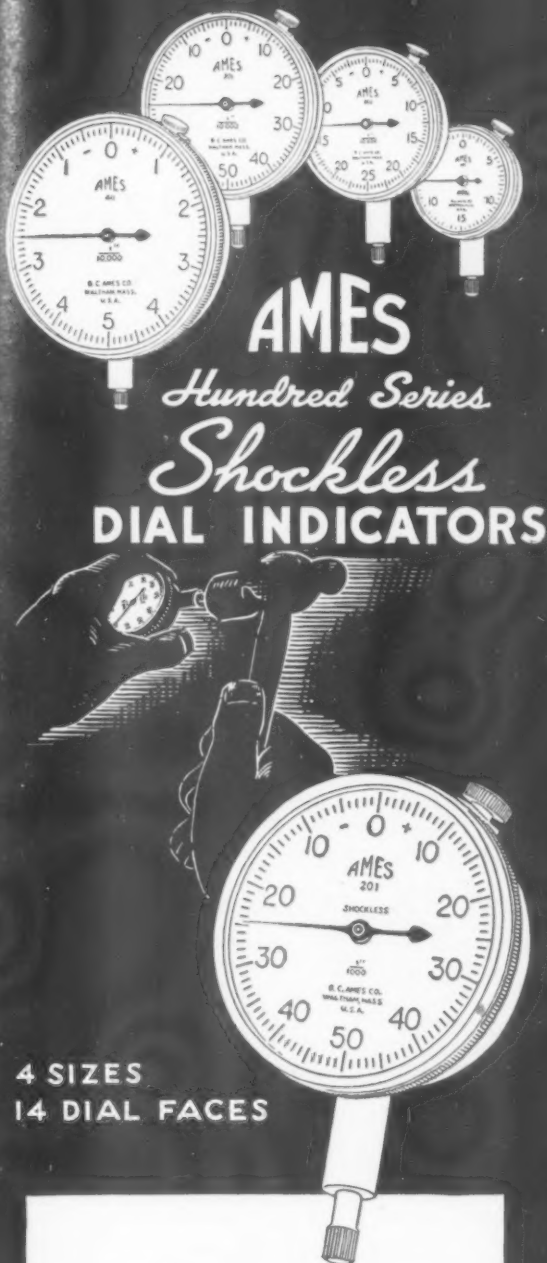


RECTANGULAR MODELS
*2 1/2" x 5" 8" x 24"
5" x 10" 12" x 36"
6" x 18"

*Differs from illustration



**BROWN & SHARPE
MAGNETIC CHUCKS**
PERMANENT MAGNET TYPE



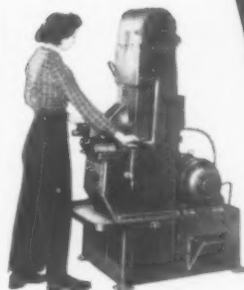
Ames Dial Indicators have small and accurately made gear trains for indicating size variations as fine as .0001". These highly sensitive gear trains are protected from damaging shocks by a simple shock-absorber which does not change their action or appearance.

Get acquainted with these popular shockless indicators by ordering them with any dial numbering desired.

Complete catalog on request.

B. C. AMES CO.
WALTHAM MASS., U.S.A.

★ Learn What **WET-BELT SURFACING** *can do for YOU...*



★ More and more applications are being found every day for this advanced machining method that works an entire area at once, that produces final finish while taking the cut, that eliminates heat, dust, distortion, discoloring, fracturing. Wet-Belt surfacing is amazingly fast—5 to 25 times faster than previous methods. It is simpler—often eliminates need for jigs, as well as set-up and lock-up time. It is so accurate that tolerances of .0005" can be held when desired. It enables inexperienced workers to get increased production and superior finish. It can handle many operations now performed on grinders, millers, shapers, planers. It supplements other machines to step up production, reduce costs, and improve results.

The Porter-Cable Wet-Belt Surfacar has been a revelation in many shops. Learn more about it. Send for our new booklet, which is virtually a text-book on the subject. Fill in and mail the coupon right away.

PORTER-CABLE MACHINE COMPANY

Porter-Cable Machine Co.

1610-6 North Salina St., Syracuse, New York

Mail me free booklet, "A New Precision Machining Method."

Name

Company..... Position.....

Street..... City & State.....

NEW LITERATURE

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

OF INTEREST TO PRODUCTION EXECUTIVES

(1035) Steel Specifications

Containing information on how to specify steels used on well-known makes of machines, a listing of complete specifications of all wheels and mounting plates has been compiled by Waltham Grinding Wheel Co. It is designed to be helpful to users of plate mounted wheels, especially to purchasing, stock control, and production departments. A listing of standard sizes of straight wheels, commonly used in sharpening carbide cutting tools also is available.

(1036) Welding

General Electric Co. has issued a new bulletin entitled "Alternating-Current Arc Welders." It contains numerous experience reports from large users of arc welding in many different industries, a discussion of "deep-fillet" welding technique, a description of all GE a-c arc welders for manual operations, and details on many GE electrodes.

(1037) Electronic Drives

Electronic Equipment Corp. has available a bulletin on electronic motor drives. It contains a complete description of the equipment made by the company and outlines suitable applications.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(1038) Drilling

Entitled "Passport to Progress," a new bulletin has been issued by Hoefer Mfg. Co. It contains illustrations and descriptions of the company's complete line of multiple drilling heads and shows typical applications of each.

(1039) Gages

Fonda Gage Company announces a new bulletin entitled "Precision in Millionths." It describes the company's new "Ultra-Finish" processing method for obtaining high accuracy finish on gage blocks. Also, it contains a list of the company's complete standard line of gage blocks, including metric sets.

(1040) Tapping

Detroit Tap & Tool Company has just issued a six-page four-color folder, designated as Bulletin LTM-44. It contains a detailed description of the company's light duty tapping machine, a

detailed list of specifications, descriptive line drawings and photographs, and information listing improvements and special applications of the machine.

(1041) Thread Grinding

The Dumore Company has available a new bulletin dealing with its Dumore No. 5 grinder and thread grinding attachment. It describes the setup for thread grinding in considerable detail and contains tables of helical angles for both standard and acme threads.

(1042) Ratchet Wrench

Designated as Bulletin M-10, descriptive literature describing a new reversible ratchet wrench with a double head for accommodating two sizes of nuts, has been issued by Greene, Tweed & Co. The bulletin shows how the tool is designed and used, tabulates its applications, and includes data on dimensions of sizes which cover nuts for all standard square and hex bolts and studs up to 1 1/4".

(1043) Diamond Tools

Consolidated Dia-Tool Division of Consolidated Diamond Saw Blade Corp., has available a 16-page catalog (Continued on page 188)

Quick — As — Wink

**CAM
OPERATED
3-WAY
VALVE**



No. 8099-RA-3

For on-off and exhaust service for air, oil, or water up to 200 lbs. pressure. Valve is actuated by hardened contacting cam. Short travel, balanced action, no metal-to-metal wear. Easy to mount and operate. Ideal for single-acting cylinder control; suitable for pilot valves to diaphragm tops, safety interlock control, or any type of mechanical operation. This valve is also available with cam, equipped with hardened roller.



WRITE FOR THIS BOOK

128 pages of illustrations, diagrams and engineering data, and information on pressure control.



C. B. HUNT & SON

1868 E. PERSHING STREET

SALEM, OHIO

There's a control valve to meet every problem in the Q.A.W. line.

**Now is the time to think
about Molybdenum...**



With both molybdenum and tungsten again available for use in high speed steel, consideration of their comparative performance is timely.

Before the war, a careful recording of comparative tests converted many users and tool makers to molybdenum high speed steel. During the tungsten shortage, when use of a high percentage of molybdenum types became mandatory, most users could not watch the performance of their tools carefully enough to draw conclusions

on their respective merits.

Reports from large tool producers and users confirm that molybdenum high speed steels, when properly heat treated, perform at least as well under different kinds of shop conditions as the tungsten types which they replace.

Given equal performance on any particular type of work, an investigation of the saving in machining cost effected by molybdenum steels will prove well worth while.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING
DATA ON MOLYBDENUM APPLICATIONS.



MOLYBDIC OXIDE, BRIQUETTED OR CANNED •
FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company
500 Fifth Avenue • New York City

containing general information and instructions for use of diamond tools. It also contains a complete listing of the company's line of standard tools.

(1044) Inspection

George Scherr Co. has issued a new bulletin dealing with its Spencer binocular microscope for finish control. It discusses control of surface finish and lists features of construction, together with a table of specifications.

(1045) Taps

A new hand book designed as a practical guide for workmen using all types of taps, has been published by Threadwell Tap & Die Co. It contains considerable valuable information both for the novice and the experienced workman. Typical of subjects discussed are, kinds of taps, correct fit, number of flutes, selecting the right tap for a particular job, tap drill sizes, cutting speeds, sharpening, and causes and cures of various tapping difficulties.

(1046) Collets

Hardinge Brothers, Inc. have issued a new bulletin illustrating and describing their style "S" Sure-Grip master collets and pads. It contains illustrations and information dealing with features of the collet, and also includes a list of specifications.

(1047) Machining Accessories

The Ready Tool Co. has issued a new catalog, designated as No. 44, dealing with ball bearing centers, high-speed

INFORMATION FREE

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centers, tool holders, grinding dogs, and boring bars. It contains complete specifications, descriptions, illustrations, and prices.

(1048) Abrasives

The Sterling Grinding Wheel Division announces a new folder describing its mounted wheels and mounted points with detachable spindles. It illustrates the company's wide variety of wheels and shapes for grinding in inaccessible places and hard to get at locations. Complete specifications and prices are included.

(1049) Surface Measurement

Physicists Research Company has just released its second edition of Practical Surface Roughness Measurement. The completely revised booklet contains information on surface roughness and its measurement, and describes the complete line of Profilometer roughness-gaging equipment. It lists complete specifications and prices on all Profilometer units and accessories.

(1050) Cutting Tools

Wendt-Sonis Company has published a new catalog, designated as their No. 144, listing tools specially designed for

carbide tipped construction. The catalog also lists redesigned standard tools, and engineering data.

(1051) Cutting Tools

Cleveland Twist Drill Co. has just issued three new booklets. The publications cover the company's Mo-Max Molybdenum-Tungsten high-speed steel, carbide cutting tools, and aircraft cutting tools.

(1052) Cutting Tools

Haynes Stellite Co. has issued a revised pamphlet dealing with its Star J-Metal Cutting Tools. It includes information on sizes and prices of round tools in addition to complete data on standard square, rectangular, and tipped tools. It also contains information on standard milling cutter blades, tool holders and adapters, and alloy wear strips.

(1053) Tool Repair

Handy & Harman has issued a new bulletin entitled "How To Repair Broken Cutting Tools with Easy-Flo." The booklet is a treatise on the subject of repairing broken tools. It describes in detail the Easy-Flo brading method for repairing broken broaches, milling cutters, saws, or other cutting tools economically.

(1054) Precision Measurement

Written for inspectors, machinists, plant engineers, and others dealing with precision measurement, a new 20-page (Continued on page 190)

**Precision
WELDING
FIXTURE
EMPLOYS**

**7 NOPAK CYLINDERS
2 NOPAK VALVES ★★**

**OPERATES
ON AIR OR
FLUID
POWER**

This fixture, developed at the Wenthe-Davidson Co., Milwaukee, holds split-ring tubing in position on a cylindrical mandrel while the seam is welded within a tolerance of .003". Six small NOPAK Cylinders, arranged in a circle, actuate lever-clamps which apply equal pressure over the exterior surface of the tubing. The large cylinder operates push rods which eject the finished tube from the mandrel.

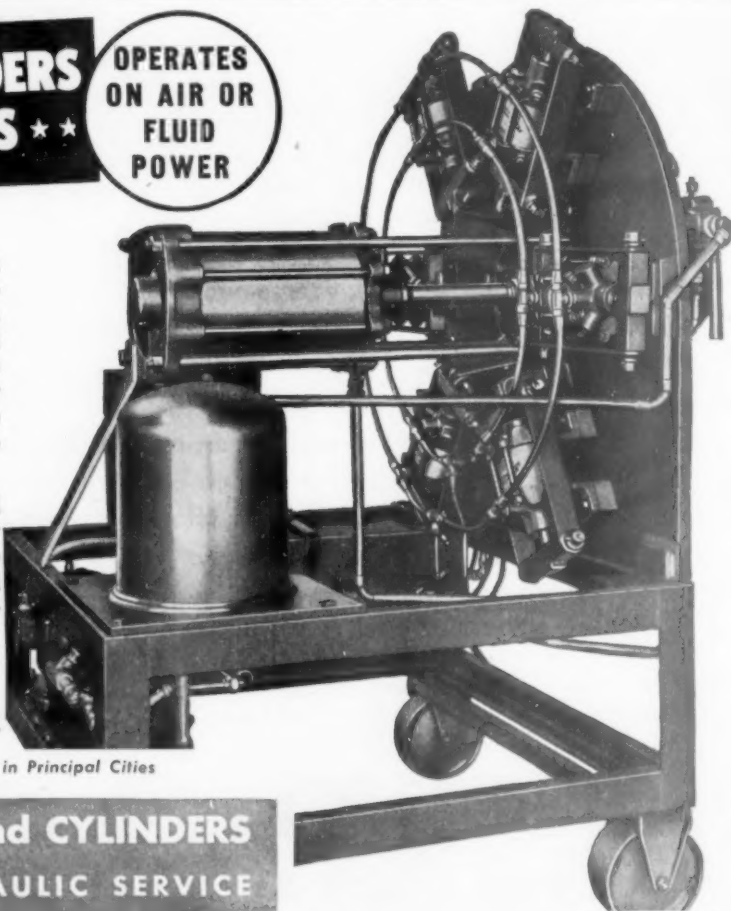
One NOPAK 4-Way Valve controls the 6 small cylinders; another controls the large ejector cylinder. This fixture is designed to operate on air or fluid power, at will. A self-contained electrically driven unit quickly generates hydraulic power if air is not available.

For further particulars on this unique example of skillful tool engineering, write for illustrated bulletin.

GALLAND-HENNING MFG. CO., 2757 S. 31st St., Milwaukee 7, Wis.

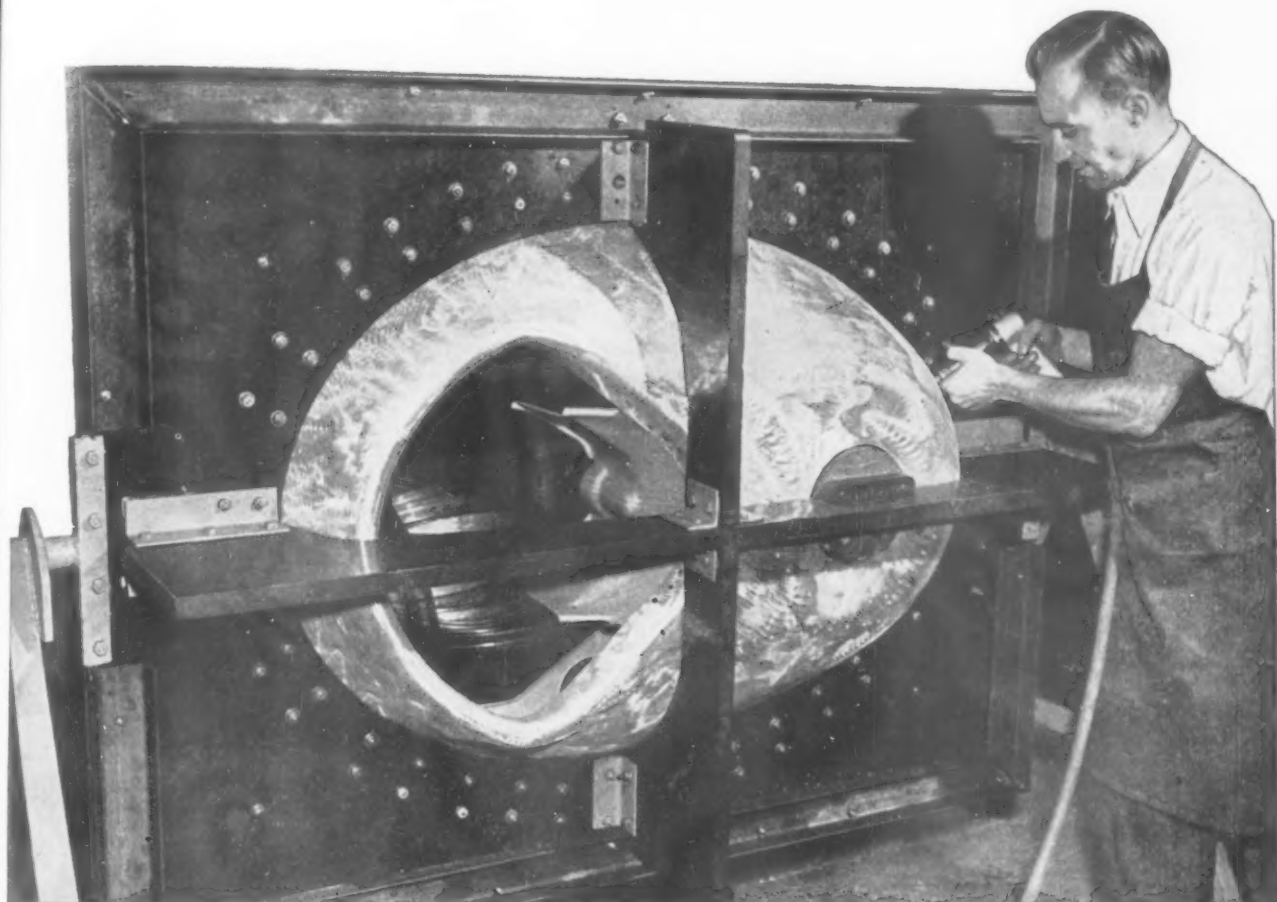
Representatives in Principal Cities

NOPAK VALVES and CYLINDERS
DESIGNED for AIR or HYDRAULIC SERVICE



A 4418-1/2 H-A

MORE MASONITE* DIE STOCK MEANS LESS WEIGHT, TIME AND COST



A great deal of Masonite Die Stock is used in this jig for assembling the nose cowl of a plane at Fairchild Aircraft, Division of Fairchild Engine & Airplane Corporation.

WHEN you use Masonite Die Stock in assembly fixtures, you win three different ways. You save *weight—time—costs*.

This amazing semi-plastic material is only one-sixth the weight of steel. Yet it acts like metal in that it helps solve problems relating to dimensional stability, rigidity, torque and deflection.

You save time and money with Masonite Die Stock because this material, thickness for thickness, is a fraction of the cost of metals—because of the speed with which it can be worked with either metal-cutting tools or with high-speed pattern shop equipment.

Today, you find this modern die stock widely used in aircraft plants throughout the country. And it has also become a prime favorite of other fabricators of thin-gauge metals who want to do a *faster, better job at less cost*.

Masonite Die Stock is available in thicknesses of $\frac{1}{4}$ to 2 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. Whether you want to reduce the size of steel members in assembly fixtures—or whether you are concerned with some of the other uses of Masonite Die Stock—get acquainted with this remarkable material at once. Simply fill out and mail the coupon.



TRADE-MARK REG. U. S. PAT. OFF. COPYRIGHT 1944, MASONITE CORP.

Awarded to the Masonite Corp.
plant at Laurel, Miss.



MASONITE CORPORATION Dept. TE-6, 111 W. Washington St., Chicago 2, Illinois

Please send me illustrative literature and complete information about Masonite Die Stock.

Name and firm _____

Address _____

City _____ State _____

booklet, entitled **How To Measure in Micro Inches**, has been issued by Continental Machines, Inc. Profusely illustrated, it describes the use of gage blocks, vernier gages, sine bars, master parallels, flats, and other precision measuring instruments. Also included are charts and drawings showing the relationship of various dimensions as affected by temperature of materials.

(1055) Plating

United Chromium, Inc., has issued a new bulletin dealing with its alkaline copper plating process. In addition to summarizing characteristics of the process, it also lists a plating speed table.

(1056) Thread Grinding

Dalzen Tool & Mfg. Co. has available a four-page folder dealing with its Thymotrol equipped thread grinders. In addition to a complete description of the grinder and electronic control, it contains a complete list of specifications on size, capacity, operation, lubrication, and coolant.

(1057) Chucking

Rockford Magnetic Products Co., has available a new catalog dealing with its magnetic chuck. It contains illustrated descriptions of holding methods, operating instructions, various applications, and general specifications.

(1058) Gages

The Pipe Machinery Co., has issued

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

a new folder on its pilot gages. The folder lists advantages and special applications of the gages, and illustrates the various models.

(1059) Cutting Tools

Cogsdill Twist Drill Co., has issued a new catalog, designated as No. 10, listing its complete line of twist drills, center drills, reamers, counterbores, and miscellaneous tools. The catalog also contains discussions on bearingizing tools, Aeromatic drives, cutters, and pilots, and includes section dealing with various mechanical data such as drill point grinding, twist drill failures, speeds and feeds for twist drills, table of tapers, tap drill sizes, decimal equivalents, and weights of steel.

(1060) Metal Fasteners

The American Institute of Bolt, Nut, and Rivet Manufacturers, has released the first issue of its new publication, entitled **Fasteners**. The publication is intended to disseminate information on the Institute's broad service to users of fasteners. A number of subjects never before investigated have been selected and the first project is already under way at Northwestern University.

The first issue of the publication contains articles on the rolled screw thread process, cold driving of large rivets, tentative specifications for cold-riveted construction, standards for hexagon and square bolts and nuts, proper tightening of nuts, and a digest containing current information on bolts, nuts, rivets, and screws.

NEW BOOKS

The Oxy-Acetylene Handbook. The Linde Air Products Company. 387 pages. Price \$1.50.

Written as a guide for self-instruction or for a standard classroom textbook, this book deals adequately with the fundamentals of the oxy-acetylene process. However, it does not stop with an elementary coverage of first principles, but goes on to the more involved techniques demanded of the skilled welder.

The book is written from a "how-to-do-it" slant and includes such subjects as how to set up, operate, and care for oxy-acetylene apparatus; selecting and using flame adjustments; identifying metals; how to weld common and unusual metals; bronze-welding; heating; bronze-surfacing; hard-facing; flame-hardening, and silver-brazing; how to test welds; development of welding procedure controls, and organizing and laying out a welding shop.



NO OUTSIDE PIPING..
with this type
GUSHER COOLANT PUMP

Suited for today's high-speed production, Gusher Coolant Pumps help you to meet the most urgent production schedules. Simple in design, trouble-free, efficient, dependable. Our line includes immersed types, tank units, flange-mounted types; also plain-shaft and belt-driven types. From a dribble to 200 g.p.m. —1/10 to 2 H.P.

See Section 5 of New Catalog

Gusher Pumps Patented and Patents Pending.

Write for complete new catalog indexed for quick reference.

Internal discharge through center of intake eliminates piping.

THE RUTHMAN MACHINERY CO.

1825 READING ROAD

CINCINNATI 2, OHIO

The "Gusher" — A Modern Pump for Modern Machine Tools

THE IMPROVED NIELSEN LIVE CENTERS

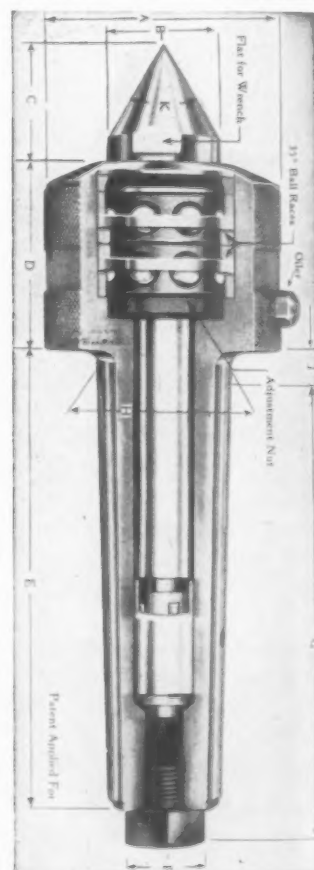
Load capacity
200 to 40,000 lbs.
at 100 rpm

Have adjustment
to take up wear
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Standard Morse
Taper No. 2 to 6
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WHAT DO *You* PAY FOR IN CARBIDE TOOLS?

Carbide tipped cutting tools have done such a phenomenal job in increasing production, cutting costs and improving quality that it is easy to overlook some fundamentals when we talk about carbides.

For example, tool cost per piece with carbides depends even more on the know-how of tool design, grade selection, precision, manufacture, and application than it did with high speed steel tools.

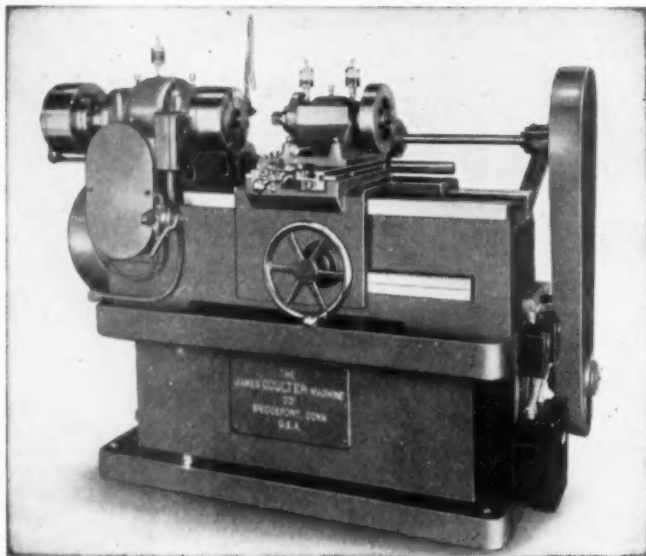
To meet mass tooling requirements for war, everybody in the carbide industry—including ourselves—has been producing so-called “standard” tools. Even in peacetime, of course, there will be a place for such tools, but we also know that when COST PER PIECE is an important consideration, the lowest priced tool is not necessarily the best.

We at T.C.T. have been producing carbide cutting tools since they were first introduced in the United States. We know from experience that T.C. tipped tools, tailored for a specific job more than pay for their initial cost. It is well at this time not to lose sight of this fact, when most of us have become accustomed to ordering standards to obtain something in a hurry.

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PRECISION THREAD MILLER FULL AUTOMATIC CONTROL



INTERNAL OR EXTERNAL RIGHT OR LEFT — UP TO 7 INCH DIAMETERS
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MADE TO SPECIFICATIONS
with EVEREDE Triangle Bit

Micrometer adjustment with
indicator dial on wrench.
Assuring accuracy regard-
less of bit angle. Furnished
with solid bits of Tungsten
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NO FORMING OR
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Adjustable to
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lathes

Are adjustable to
fit various size
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Holders keep the boring bar in a horizontal
position, regardless of any change in the size
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for lathes from 7" swing to 9". • The No. 2
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The ONLY Boring
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Made of finest nickel steel, heat treated,
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Bars for lathe boring range from 7/32" to
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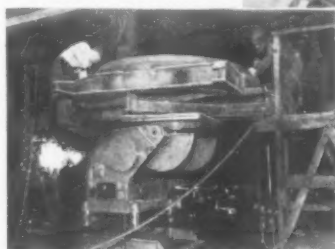
Basically designed for position welding, Ransome Welding Positioning Equipment has found many valuable uses throughout industrial plants. If your product presents a problem involving turning and tilting in the manufacturing process, consider these units in the interest of easier handling, faster production, better quality work, and reduced worker fatigue.



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Work can be positioned for drilling at different angles by simply tilting or turning the positioner table top.



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Valve seats, rings, and other products can be coated with hard-surfacing material better and more uniformly, eliminating unnecessary material waste and reducing grinding time.



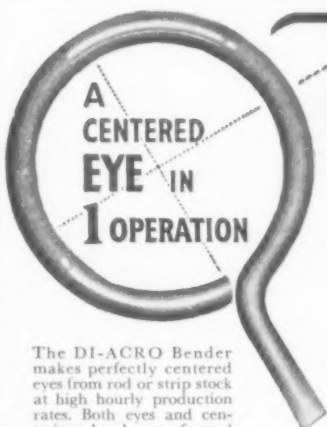
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By quickly positioning work, a faster grinding or chipping job can be done.

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Forming radius 6" approx. Capacity 1/2" round cold rolled steel bar, formed cold to 1" radius. Also Bender No. 3, with forming radius 9" approx.

Precision CENTERED EYE Bending

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DI-ACRO Precision Bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

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HANDY ANDY

Says—

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

FOR ONCE, writing the column—
or rather, the start—has been a chore smacking of hard labor. The Muse has been contrary, diverting my thoughts to the great outdoors (as confined to my backyard garden- and vernal occupations. So, I've sprayed, pruned and spaded until, my joints creaking, I'd be quite content to sit down to the portable and hammer out a springtime rhapsody. But, readers from hither and yon have braced me for opinions on everything from OPA 452 to the '44 election, not omitting the mooted foremen's union, and as you know, I just don't take a dare. So, we'll just defer "the dance of the rose bugs" until next Spring.

What I've termed OPA 452, above, is a regulation fixing the price of manufactured goods, and especially automotive parts, as of March 31, 1942. The intent behind the regulation is altruistic enough, and, all things being equal, it should result in the desired end, which is to forestall inflation.

Unfortunately, all things aren't equal. For one thing, wages have soared con-

siderably since '42, with the almost foregone conclusion that organized labor will demand the same wage for a 40-hour week, after the war, that is now paid for the longer. And since (to my belief at least) labor is producing only about 70 per cent of a fair potential, even on vital war work, one may expect this neo-philosophy of more money for less work to prevail in the immediate postwar period.

Everything considered, then, manufacturers resuming civilian production will be handicapped from the start. A nominal unit profit of, say, 5 per cent, would be cancelled out by a wage increase of anywhere from 8 to 10 per cent, with no guarantee that this would be offset by a commensurate increase in output. Truly an encouraging prospect!

As I see it, there are only two ways to effect a parity. One is through engineering, so that the machine does the work and the operator becomes but incidental in the production scheme. But even that can be carried to extremes, since a real economy presumes

the employment of the greatest number of workers at the highest wages commensurate with reasonable profits. Machines can only produce; they can't buy.

The other way is through a strong employers union, strong enough to command the respect of vote-hungry politicians and to effect equitable changes in existing laws. Consider, now, that labor has been fused into powerful units through one of the great cohesive forces—hatred of a common denominator as represented by the employers.

The latter, on the contrary, have remained divided because of rivalry and emulation. The result is that each, in turn, has been bowled over to become a stepping stone for assault against the next. If, now, they could be made to reconcile their difference, and to unite for their common interest, they could become a powerful counterforce against the tide of extreme leftism that now threatens our economic structure. A strong employers' union has to come, if we are to have industrial parity, so why defer the inevitable? Get going!

Now, as to the '44 election. Personally, I don't favor a Roosevelt dynasty; yet, I can't see a serious contender on the political horizon. Willkie, of the "loyal opposition", eliminated himself, and Gen. McArthur, although an able soldier, might turn out to be another U. S. Grant. Of the rest, Dewey has an edge for the nomination, with Stas-

(Concluded on page 196)

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Specialized steels for exacting service are required for both war production and essential machinery manufacture.

B&L Cold Finished furnace treated Bar Steels are adapted for a wide range of these different needs and they offer advantages of interest to designers and tool engineers in developing special machine parts.

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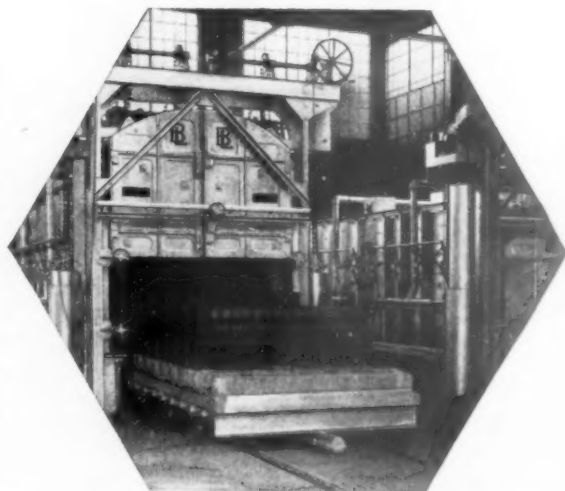
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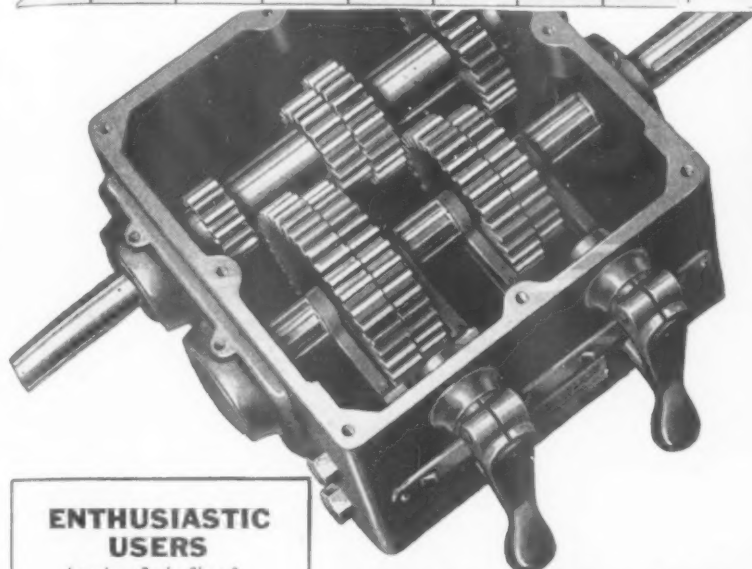
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SPEEDS UP PRODUCTION • CUTS DOWN COSTS



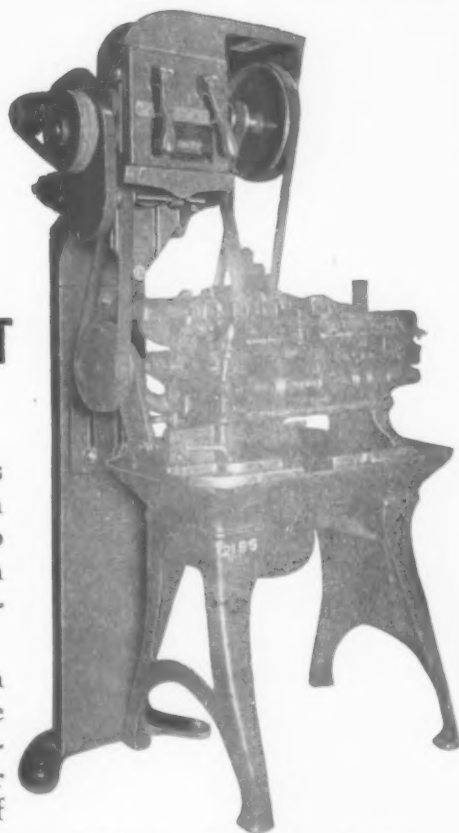
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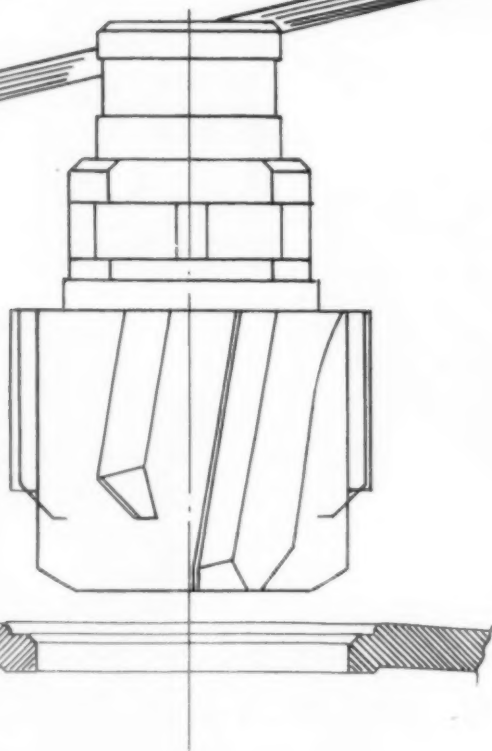
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Founded thirty years ago

DETROIT AND FERNDALE, MICHIGAN

—HANDY ANDY SAYS— (Concluded from page 194)

sen, who renounced a successful governorship to join the armed forces, as a dark horse. Write your own ticket, and figure the odds.

Frankly, the '44 election is a minor consideration compared to winning the war in the quickest possible time and with a minimum loss of life. And, to change leaders now would be tantamount to repudiating whatever policies have been established for its successful conclusion. Such, at least, is my belief. As for my wishes—well, I'd like to see the war over with by October so that Mr. Roosevelt could realize his ambition to raise Scotties. Eh, Falla?

As regards the foremen's union, I find myself torn between conflicting prejudices. I'm agin' any collective bargaining union of supervisors, having always contended that supervision is inherently a part of management. And, when a man gets promoted to leadership, he should also be man enough to brace the Old Man by his lonesome and not gang up on him.

However, blame for the foremen's union rests squarely on three groups—on management (as represented by the inner circle), on the Wage and Hours Commission, and on the foremen.

Management is to blame because, on the whole, it did not properly analyze prospective foremen for qualities of leadership. And, having promoted them, it did not follow through with an adequate training program that would at once inspire responsibility and loyalty to the employing organization. Too often, men were promoted from the ranks and then were left to work out their own salvation.

The Wage Stabilization Act froze wages of supervision; meanwhile the N. W. L. B. sanctioned wage increases in the ranks that usually topped the stipends of the foremen. That rankled! To make matters worse, management often as not ruled against the foreman when some issue came up between him and a line steward.

Finally, the foremen were to blame because, individually and collectively, they lacked the patience with which strong men contend against odds. They cracked under the strain, and, in a time of national emergency, resorted to strike and its incidental roughhousing to gain their ends. That was wrong, regardless of provocation.

Personally, I can see the thing from the foremen's viewpoint. They had a real grievance, but more against the labor and wage setup than against the employers. And they had one of the strongest cases of any group of workers within or without the ranks of organized labor; yet, by precipitate action, they sacrificed public support.

However, their situation is no worse than that of thousands of engineering workers whose salaries are also frozen and who have to contend with conditions just as trying as those faced by the foremen. And they don't strike! They just gripe—and griping never held up vital production.

THE END.

THE TOOL ENGINEER

IT'S TOO BIG A STORY

to tell on this page...

WALES HOLE PUNCHING UNITS

are cutting production costs throughout the metal fabricating industry by *reducing die costs, set-up time, and press "down time."*

The same group of units, by unique, independent, self-contained design, may be set up in unlimited patterns on press brakes and stamping presses to punch holes in channels, angles and sheets. Such wide applications and adaptations of Wales Hole Punching Units make **TOO BIG A STORY TO TELL ON THIS PAGE**. That is why you should write **TODAY** for fully-illustrated, functionally-colored catalogs that will show you how Wales Units operate more efficiently to produce greater economies both today and tomorrow.

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Specialists in Punching and Notching Equipment

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WALES *Plate Set System*
FOR PUNCHING SHEET METAL



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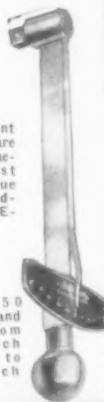
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Over 50
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0-40 inch
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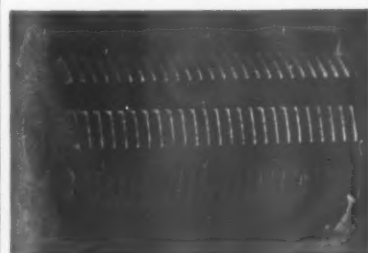
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Regular or interrupted tooth form

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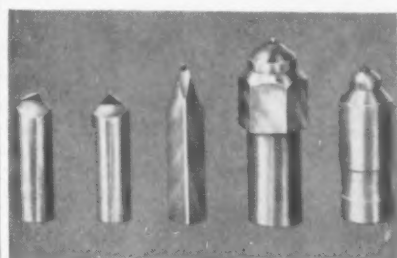
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JUNE, 1944



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WHEEL DRESSING TOOLS—CAREFULLY SELECTED, HARD, SOUND DIAMONDS — EXPERTLY MOUNTED TO WITHSTAND THE RIGORS AND HARD KNOCKS OF TODAY'S INCREASED PRODUCTION SCHEDULES.

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And more economical too, with C-F Positioners. Permit downhand welding of top, bottom and sides with a single setup — more uniformly perfect joints, better fillets and beads. Eliminate frequent crane-lifts, save crane-operator and sling crew time. There's a model for every need — from small, hand-operated types to giants that handle 30,000 lbs weldments. C-F Positioners revolve a full 360°, tilt to 135° beyond horizontal. Table rotation from 0 R.P.M. up, for automatic welding. They are universal tools, adjustable for height — pedestal or boom mounted to give maximum floor and working clearance.

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● For application blanks and information pertaining to membership in the American Society of Tool Engineers, address the Secretary's office, 2567 West Grand Boulevard, Detroit 8, Michigan.

● Senior initiation fee is five dollars. Dues eight dollars per year for senior grade membership and five dollars per year for junior grade membership. Junior initiation fee is five dollars.

Atlanta: Joseph H. Walter of Castaloy Metal Corp., was principal speaker at the May 3 dinner meeting at Holsum-Dumas Cafeteria. Approximately 100 members and guests attended.

Mr. Walter spoke on "Use of Cerro-Alloys in Aircraft Tooling." His talk, accompanied by films, paid particular attention to the use of alloys in the manufacture of jigs and other tools involving intricate contours.

Baltimore: Coffee speaker at the May 3 meeting, held at the Engineer's Club, was Mr. Schlusser of American Hammered Piston Ring Division of Koppers Co. He spoke briefly on the benefits to be obtained in using a series of conferences on "Job Training in Industry."

J. C. Talbott, retiring meetings chairman, read a lecture by J. J. Caton, director of education, Chrysler Institute of Engineering. Entitled "The Man We Don't Know", the lecture dealt with the engineer and his job. Also on the program was the showing of two movies entitled "Dial Indicators" and "Dial Indicator Gages," shown through the courtesy of the Federal Gage Co.

Binghamton: Edgar Wilson, of F. L. Phillips Co. addressed the May 10 meeting held at the Arlington Hotel. He gave a general talk on the history of the casting industry and discussed some of the complications foundry men encounter when molding castings.

Boston: The technical speaker at the May 11 meeting, held at Schrafft's Restaurant, was G. A. Sawin, Jr., of Westinghouse Electric & Mfg. Co. His talk on electronics and their uses was accompanied by slides. He also showed a Westinghouse film entitled "Electronics At Work."

The gadget talk was given by Hart Nichols, of W. H. Nichols & Sons, and dealt with the development of a machine for generating the curves on wing surfaces for wind tunnel tests. The method was illustrated with a plywood mockup.

Speakers at the April 13 meeting were W. B. Kennedy of the Watertown Arsenal, who gave a gadget talk on tipping high-speed steel, and Joseph Pacell of Morse Twist Drill Co., who talked on engineering feats of the honey bee. Also on the program was an address by Anthony J. Snyder on the proper selection and use of cutting tools.

Buffalo-Niagara: More than 125 per-

sons attended the April 20 meeting held at the Trap & Field Club.

J. B. Wilkie, Gage Sales Engineer for Pratt & Whitney Division, Niles-Bement-Pond Co., spoke on "Gages." His talk was supplemented by slides.

At the May 18 meeting, Fred W. Whitcomb, research engineer of Deep-Freeze Division, Motor Products Corp., spoke on "Stabilization of Steel at Sub-Zero Temperature."

Central Pennsylvania: Lloyd V. Bollinger, assistant sales manager of American Insulator Co., was technical speaker at the April 11 meeting held at the Engineering Society, in York.

He talked on the composition of plastics and the various means of moulding the respective types, concluding with a display of assorted items made by the processes he described. He also gave a general discussion on "Plastic Moulding."

Regional director Hallett D. Jones gave a review of events at the 12th annual meeting at Philadelphia and of the executive sessions held at the same time.

Chicago: In place of the regular meeting, the chapter held an informal dinner dance at The Furniture Club of America, at the Furniture Mart Building, May 6.

The entertainment included a reception and cocktail hour, dinner, an elaborate stage show, and dancing.

Cincinnati: Ben O. Stoner, president of the Cincinnati Kiwanis club, was speaker at the sixth annual banquet May 27. He talked on "Peace and Postwar Planning."

Cleveland: I. E. Rivkin, representing the Molina Industrial Diamond Company of the United States, was technical speaker at the May 12 meeting held at the Hotel Hollenden. He talked on "Industrial Diamonds." Also on the program was an address by Dewey Mitchell, police trainer and jiu jitsu expert, who talked on self defense.

Columbus: Kermit T. Kuck, chief engineer, the Monarch Machine Tool Co., was technical speaker at the May 9 meeting held at Hotel Fort Hayes.

Mr. Kuck spoke on "Shape Turning On A Lathe." His talk covered the limited possibilities of shape turning. Also on the program was a descriptive film, showing how various shapes can be made by the shape turning method.

Decatur: J. A. Macdonald, chief tool designer of the Caterpillar Tractor Co., addressed the May 3 meeting.

(Continued on page 202)



Otto W. Winter, (left) past national A.S.T.E. president, presents charter to C. D. Wright, first chairman of newly organized Niagara District Chapter No. 65 at installation ceremonies at St. Catherines, Ontario, May 19.

GREATER ACCURACY—MORE PRODUCTION ON PARTS LIKE THESE with the SUNNEN PRECISION HONING MACHINE



Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.



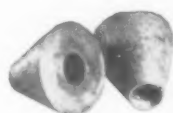
Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.



Inner Bearing Ring "Accurately removes last 'tenth' of stock."



Saved time in producing a smooth accurate finish on this bronze remote control valve body.



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."



Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.



Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.



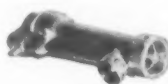
Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."



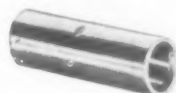
Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.



Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.



Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.



Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.



Now you can get even greater accuracy and more production per hour than ever before with the improved Sunnen Precision Honing Machine. This machine is now furnished with a larger base containing a coolant pump, which provides a constant flow of honing fluid to the part being honed. The fluid acts both as a coolant and a lubricant, giving better honing properties to the abrasive. You get a smoother finish, more accurate work in less time.

Consider These Advantages, Too

- Hones and finishes internal cylindrical surfaces from .185" to 2.625"
- Does not require skilled labor
- Accuracy guaranteed within .0001"
- Can be used in any metal or plastic except lead or babbitt
- No jigs or fixtures needed
- Economical to operate
- Quickly and easily set up

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.



Why not write today — asking a Sunnen engineer to show you how it can be used on your jobs — or ask for a bulletin giving complete information?

SUNNEN

SUNNEN PRODUCTS COMPANY, 7932 Manchester Ave., St. Louis 17, Missouri
Canadian Factory: Chatham, Ontario

Mr. Macdonald spoke on "Elements of Tool Designing," stating that the requirements for a good tool engineer include some years of machine shop background, a mental picture of mass production, and a knowledge of practical application of his skill to production. He illustrated his talk with motion pictures of machines and tools developed by Caterpillar Tractor Co.

Detroit: Col. H. W. Miller was principal speaker at the May 11 meeting held in the main auditorium of Horace H. Rackham Memorial Building.

Col. Miller talked on "Late Developments Of World War II," exploring campaigns and strategy, immediate peace possibilities, and probable long range peace plans. Also on the program was showing of a movie provided by the Signal Corps.

Elmira: C. O. Herb, Managing Editor of Machinery magazine, was technical speaker at the May 8 meeting. The subject of his address was "Negative Rake Milling."

Mr. Herb's address was augmented with slides, showing the methods used to overcome the power requirements for this new type of milling. Approximately 85 members and guests attended.

Erie: The principal speaker at the May 2 meeting held at the Masonic Building, was J. W. Devorss, engineer, New Products Division, U. S. Rubber Co. Mr. Devorss talked on "Structural Rubber."

Also announced at the meeting was the death of R. A. Williamson, one of the senior chapter members.

Fairfield County: Technical speaker at the May 5 meeting held at the Algonquin Club, was A. H. d'Arcambal, vice-president and consulting metallurgist of Pratt & Whitney Division of Niles-Bement-Pond Co. He spoke on "Precision Cutting Tools, Their Manufacture, Uses, and Care." Mr. d'Arcambal is a past national A. S. T. E. president.

Coffee speaker was C. C. Lewis of Schick, Inc., who gave a report of the annual meeting held at Philadelphia.

Fond du Lac: R. B. Straut, of Thomson-Gibb Electric Welding Co. presented a technical paper on "Resistance Welding with Modern Control Systems" at the May 13 meeting.

Also on the program were two moving pictures, "Jobs After Victory," prepared by the Automotive Council for War Production, and "Continuous Performance," furnished by the Cooper-Bessemer Corp.

Fort Wayne: Harry Fussner, sales manager of the Threading Tool Division, National Acme Co., addressed the May 10 meeting at the Chamber of Commerce Building, speaking on "Close Precision Thread Cutting with Relation to The War Effort."

Mr. Fussner stressed the necessary standardization of threads and explained many of the constructive changes

made in die heads to produce precision threads. He was accompanied by Harold Smith, chief tool engineer of the National Acme Co., who spoke on tooling of multiple bar and chucking machines for higher production. Both talks were illustrated.

Also on this program was a talk by Mathias Cawein, engineer in charge of research, Farnsworth Television and Radio Corp. He spoke on the problems facing the development of television for the post-war world.

Greater New York: Joseph S. Parker, president of Machine & Tool Design Co., was principal speaker at the May 1 meeting held at the Hotel New Yorker. He talked on "Formrite."

His lecture covered a field slightly at variance with the common understanding of tool engineering and tool problems. Also on the program was showing of a movie entitled "The Road To Berlin," depicting the accomplishments of the Army Supply Service.

Hamilton: E. Barker, president of Modern Tool Works, Ltd., spoke on "Modern Machine Tools Design and Trend", at the May 12 meeting held at the Royal Connaught Hotel.

Hartford: George A. Highberg, vice-president and chief engineer, Cushman Chuck Co., and Harry J. Hauck, vice president and chief engineer, The Goss & Deleeuw Machine Co., were technical speakers at the May 1 meeting.

(Continued on page 204)



(Left)—A modern precision instrument that checks holes without actually contacting inside surfaces. Eliminates possibility of scratching soft or burnished hole surfaces.

(Above)—Streamlined bench center. Note how inclined bed enhances convenience of working position.

AIR-OPERATED HOLE CHECKER — Checks inside diameters to ten thousandths. Quickly determines size, taper, bell-mouth and out-of-round condition. Operated by controlled air pressure and volume. Specially designed sizing plugs are made for your production parts. Flexible hose connection and adaptors furnished with unit. Dial quickly calibrated to register 0.0001".

IMPROVED BENCH CENTER — Three sizes; for checking work up to 4" dia. x 10"; 6" dia. x 24" and 8" dia. x 36". Additional diameters possible by use of raising blocks.

Adjustable heads, easily slid into position. Clamping levers hold heads in adjustment. Retracting lever permits quick removal of work. Special large size centers and bull centers for checking practically any diameters.

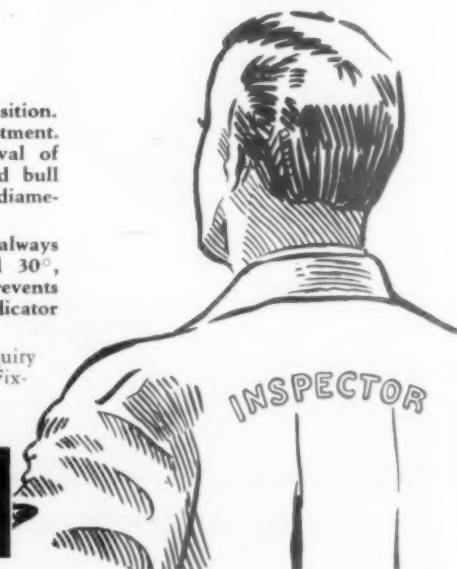
Box-type bed supported on three legs, always sits solidly on bench. Bed inclined 30°, more convenient working position, prevents misuse as "catch-all" for tools. Dial indicator 0.0001" adjustable to all positions.

Send for Bulletin 43-TE. Your inquiry solicited on special Tools, Dies and Fixtures.

To Help You
Do BETTER
Work FASTER

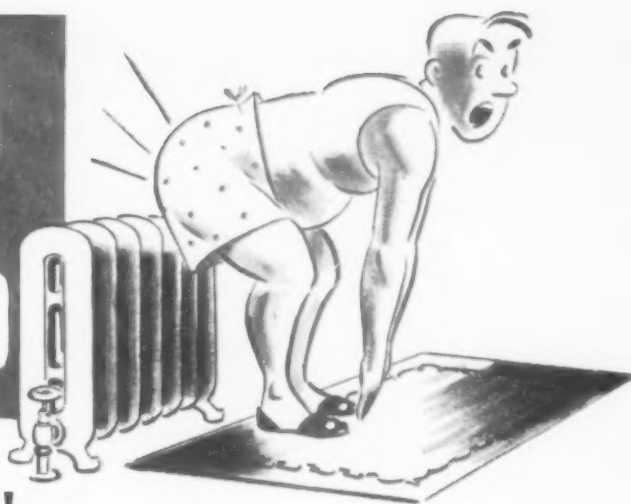


THE AMERICAN GAUGE CO.
125 Bayard St. DAYTON 1, OHIO



THE TOOL ENGINEER

HEATED *and* SQUEALED



NOT in the case shown below!
One-Third of the Grinding Time was Saved . . .
without Heating

Another War Production Test Run shows Cortland Chucks and Segments producing more at lower cost.

TEST FACTS: A large manufacturer of bearings . . . using a Blanchard No. 18 Vertical Surface Grinder . . . Wheel Speed 875 R.P.M.

WORK: Bearings—S.A.E. 52100 Steel hardened to 64 Rockwell C scale; 2.82 sq. in. surface ground per piece; 31 pieces per table load.

Detail	CORTLAND Chuck and Segments	Competitive Brand Formerly Used
Cubic inches of stock removed per inch in height of segments	350.0	87.5
Ampere readings	30	15
Dressings necessary	1	1
Work heat?	Cut cool with no noise	Heated work and squealed badly
Grinding time	112 sec.	180 sec.

Heavier feed could be used and better finish obtained with Cortland *Diagonal Shearing* Segments.

Why not find out just how Cortland Chucks and Segments can increase the quality and quantity of your grinding output? Write for our latest illustrated bulletin giving the complete Cortland performance story.

CORTLAND GRINDING WHEELS CORP.

14 Cortland Street Chester, Massachusetts

Diagonal Shearing with Varying Contact Means Better Surface Grinding



A true segment, the grinding surface has narrow ends that *start* the work with minimum shock and resistance. Straight inner edge of segment passes diagonally across work with a *shearing* action that *cuts* and *removes* the metal. Varying contact area insures longer exposure to coolant—decreases heat—reduces segment wear—conserves power.

CORTLAND

Chucks and Segments

Mr. Highberg talked on types and applications of chucks for turret lathes. Mr. Hauck's address covered types and applications of chucks for multiple-spindle machines. Both discussions were illustrated with slides and sketches.

Also on the program was a talk by John A. Rinek, test pilot for Pratt & Whitney.

Indianapolis: Ervin (Cannonball) Baker, former automobile and motorcycle racer was speaker at the May 4 meeting held at the Lincoln Hotel.

He spoke on "The Inside Story of Record Run Breaking," giving some interesting accounts of his record-breaking cross country trips in the United States and Australia.

Kansas City: Jack Koch, of the Carpenter Steel Co., discussed the relation of tool steels to SAE steels and their characteristics at the May 2 meeting held at the Hotel Pickwick. It was decided at the meeting to discontinue sessions during the summer months.

Lakehead: An "Industrial Night" meeting was held May 4 in the Norman Room of the Royal Edward Hotel. Several industrial firms displayed exhibits of the type of metal work carried on in their organizations.

Principal speakers were J. J. Russell, works manager, Canadian Car and Foundry Co., Ltd., William Webster, representative of Fort William Cham-

ber of Commerce, and A. C. Adams, superintendent of Canada Iron Foundries. Mr. Russell gave an interesting talk on spectrographic methods of quantitative and qualitative analysis of various aluminum alloys. Also on the program was showing of films through the courtesy of the Aluminum Co. of America and Canadian Car & Foundry Company.

Movies comprised the principal business of the April 6 meeting held at the George Club at Fort William. They were entitled "Production & Processing of Copper", "Industrial Lubrication," and "General War Activities."

Little Rhody: The main speaker at the April 24 meeting at Blackstone Hotel was Allen G. Shepherd, Jr., chief metallurgist of Taft-Peirce Mfg. Co. He spoke on "Practical Heat Treating & The Tool Designer." Following his talk, chapter members were guests of Taft Peirce Co. on a plant tour.

Fred L. Turner, Do-All Boston Co., was technical speaker at the May 25 meeting. He talked on "Quality Control." Also, he showed two films, entitled "Theory of Gage Blocks," to supplement his address.

Louisville: The technical speaker at the May 9, meeting held at the Kentucky Hotel, was J. N. Smith, manager, Hydraulic & Transmission Division, E. F. Houghton Co. He talked on "Hydraulic Equipment and Engineering of Hydraulic Packings."

Milwaukee: A. Bradford Reed, president of Rolled Thread Thread Die Co., was technical speaker at the May 11 meeting. He talked on "Thread Rolling As Used Today."

Also on the technical program was an address by K. W. Andrews, of Kearney & Trecker Corp., who talked on "Indian Craftsmen—Their Tools and Products."

Montreal: H. H. Fairfield, of the Mines & Geology Branch of the Department of Mines & Resources, addressed the May 10 meeting held at the Windsor Hotel. He talked on "Quality Control Principles Applied To Manufacturing Operations."

Also on the program was an address by J. C. Langford, superintendent of quality control, Defense Industries Ltd., Montreal Works Plant. His subject was "Quality Control in the Manufacture of Small Arms Ammunition."

New Haven: Principal speaker at the May 11 meeting, held at the Y. M. C. A., was A. J. Langhammer, president, Amplex Division, Chrysler Corporation. He talked on "Machine Parts Made from Powdered Metals." An open forum followed his lecture.

Niagara District: This newest chapter, designated as No. 65, was chartered May 19 at ceremonies held at the Welland House at St. Catharines, Ont., with 80 charter members.

(Continued on page 206)



EXACT PARALLELISM

pre-requisite on this exacting railroad piston ring grinding job by ARTER. There are many reasons why shopmen are enthusiastic about ARTER ROTARY SURFACE GRINDERS. Versatility, accuracy, simplification of operation, are among them. For more than a quarter of a century, ARTERS have advanced progressively. Three models now available—"A", "B" and "C" with chuck diametrical capacities for 8" to 40".

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.



TOOLS are weapons of invasion



Behind the scenes of the invasion, there are months of planning, preparation, and production. No item has been of so much importance as tools. Tools to make guns, tanks, airplanes, ships, etc.

Yes, tools are Weapons of Invasion. And tools play a more important vital role when they have been converted, recut, and reclaimed because this represents conservation of important steel that can be used for other important war needs.

The staggering demand for recut and converted high speed steel tools has at times strained our production facilities to the limit. But sched-

ules have been met. Manpower, transportation, etc. have also increased our production problems.

The Eastern Cutter Corporation, along with others, has willingly accepted its rightful burden. It has arrived at the right place at the right time with sufficient quantity to fill the tool needs of war and to supply our fighting men with the equipment they need for "D-Day".

To help you conserve vital steel and reduce tool costs, have those worn-out or obsolete tools converted or recut to either special or standard dimensions without delay. Write for complete information.

A COMPLETE RECONDITIONING SERVICE FOR TOOLS

NEW MILLING CUTTERS FROM OUR STOCK OR YOUR OWN STANDARD CUTTERS
CAN BE QUICKLY CONVERTED TO SPECIAL CUTTERS



EASTERN CUTTER CORPORATION 30-32 Littleton Ave., Newark 7, N. J.



Chrome Plant **MASTER CHROME SERVICE INC.**, 5709 Herman Ave., N. W., Cleveland, Ohio

W. J. Gamble, regional director; O. W. Winter, past president; L. G. Singer, assistant national secretary-treasurer, and Adrian L. Potter, executive secretary, officiated at the chartering.

Officers elected for the coming year are: Chairman, C. D. Wright; 1st vice-chairman, E. G. Dewar; 2nd vice-chairman, Henry Hendriks; treasurer, E. E. Garret, and secretary, G. F. Bush. O. W. Winter made the installation.

Technical speaker at the meeting was George H. Sanborn, chief field service engineer, Fellows Gear Shaper Co., who spoke on "Gears at War." Many prominent guests attended the installation.

Northern New Jersey: Philip McKenna, president of Kennametal, Inc., was technical speaker at the April 11 meeting held at Hotel Robert Treat.

He talked on "The Application of Tungsten Carbide Cutting Tools in High-Speed Milling Operations." He illustrated his talk with movies showing actual applications in various war plants throughout the United States.

E. V. Crane, chief, development engineering department, E. W. Bliss Co., was principal speaker at the May 9 meeting. He talked on "Plastic Working of Metals and Non-Metallic Materials."

Peoria: Principal speaker at the May 2 meeting, held at the Hotel Jefferson, was W. L. Kennicott, chief engineer, Kennametal, Inc.

Mr. Kennicott talked on "Super Hi-

Left to right:
Leland A. Bryant,
consulting engineer,
Consolidated Vultee Aircraft Corp.; John E. Birdsell, chairman, San Diego chapter; F. H. White, Federal Tool and Supply Co., at April 4 San Diego meeting.



Speed Milling With Cemented Carbide." He illustrated his talk with a movie on carbides.

Philadelphia: Philip Taber, chief engineer, Template Reproduction Co., was technical speaker at the May 18 meeting held at the Engineers' Club. He talked on "Tooling For Post-War Competition." The meeting was the last one until the fall season.

Pittsburgh: Four hundred persons attended the May 12 meeting held at the Fort Pitt Hotel to hear J. Edward Pendray, assistant to the president of Westinghouse Electric & Manufacturing Co., speak on "Rockets and Jet Propulsion."

One of the founders of the American

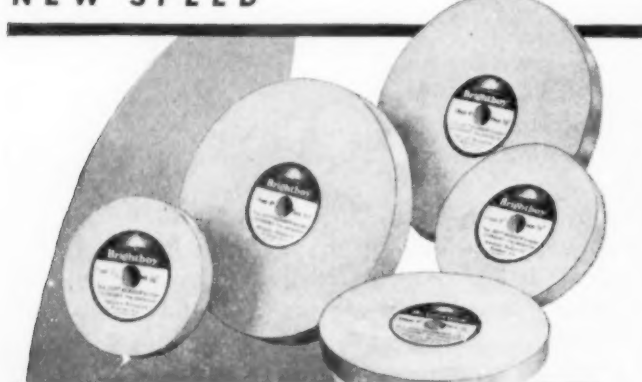
Rocket Society, Mr. Pendray explained the construction and actions of rockets, and clarified some of the statements recently made in print concerning the uses of rockets. He stated that it is possible to obtain as much as 85 per cent efficiency from this motor, but that there is one big disadvantage, namely, a high rate of fuel consumption.

Potomac: Approximately 175 members attended the May 4 meeting to hear a talk on "New Milling Art" by C. B. DeVlieg, president of the DeVlieg Machine Co.

Mr. DeVlieg spoke on the fundamentals involved in the design of rigid milling, bringing to light a number of basic principles that should be consid-

(Continued on page 208)

NEW SPEED



TO YOUR DE-BURRING FINISHING • POLISHING

Rubber-cushioned Brightboy polishes as it de-burrs and finishes. The rubber and abrasive work together, bridging the gap between the grind and the buff.

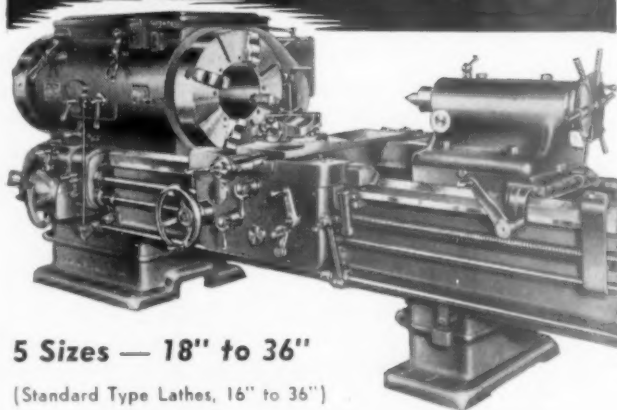
Brightboy Methods and Applications are described in a booklet which your dealer will be glad to give you, together with prices. Brightboy field representatives are at your service.

BRIGHTBOY INDUSTRIAL DIVISION,
Weldon Roberts Rubber Co., Newark 7, N. J.

WELDON ROBERTS
Brightboy

HYDRATROL LATHES

Large Hollow Spindle Type



5 Sizes — 18" to 36"

(Standard Type Lathes, 16" to 36")

There are many jobs today which undoubtedly could be **better** done on this machine . . . Investigate!

Lehmann MACHINE CO.

CHOUTEAU AT GRAND • ST. LOUIS 3

EIGHT

things to think about **BEFORE ORDERING ANY MILLING CUTTER**

There are eight fundamental points that should be covered before ordering any milling cutter. On these depend the accuracy, production, dependability, and profit of your milling machines.

- 1 An inserted-tooth type cutter has the advantage of highest strength in the body and hardest material at the cutting edge without compensation for either—plus the maintenance feature of merely changing blades rather than replacing the complete mill.
- 2 The serrations, for locating the blade in the body, should be on the front of the blade so that the back will have a plain surface to contact fully on a plain surface in the body.
- 3 The blade locking device should be simple and positive so that blades are an immovable part of the assembly even on heavy, intermittent cuts.
- 4* Advancing, replacing, and sharpening of blades must be a simple, easy, accurate operation that will reduce down-time to a minimum.
- 5 Body and blade design must be such that HSS, carbide tipped, and alloy blades can be used to full advantage under high speeds and heavy feeds.
- 6 Production should not be handicapped through inability to replace any type of blades quickly from the supplier's stock.
- 7 Blades must be interchangeable in every mill and interchangeable in as many mill styles and sizes as is practical without sacrificing strength or cutting qualities.
- 8 Choose a reliable milling cutter manufacturer who is equipped with the background and engineering skill to supply standard or special designs that are right—and delivered on time.

We hope you will try this check list on Lovejoy milling cutters and the Lovejoy Tool Company. We believe you will check it 100%, just as others have done for the past 27 years.

* Lovejoy manufactures a complete line of inserted-tooth type products—all equipped with the famous Lovejoy positive-locking device to assure maximum production at minimum cost. The illustrations at the right show how simple it is to keep Lovejoy tools at highest cutting efficiency.



Tap out the wedge—

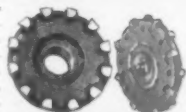
Move the shoe down—

Tap in the wedge—Grind

IT'S AS SIMPLE AS THAT!

Lovejoy

TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.



MILLING CUTTERS



BORING HEADS



ARBORS



SPOT FACING TOOLS



COUNTERBORES



BORING BARS



SINGLE POINT TOOLS



TURRET TOOL POSTS

ered when designing machines and tools.

Douglas D. Burnside, national president, attended the meeting and gave a short talk. Also on the program was the showing of a movie on turret lathes, their operation and use, presented by Gisholt Machine Co.

Racine: More than 180 members and guests, the greatest number in the chapter's history, attended the April 24 meeting held at the Danish Brotherhood.

Principal speaker was Dr. H. A. Frommelt, research director of Kearney & Trecker Corp., who gave an interesting talk on new techniques in the use of carbide cutters for the milling of hard steel alloys. His talk was illustrated by movies.

Rochester: At the "Past Chairman Night" meeting held May 10 at the Hotel Sagamore, Otto W. Winter, past national president, was chief speaker.

The program included a review of chapter history by Historian Charles E. Codd, and entertainment by J. Howard Spaulding, of Screw Machine Engineering, assisted by Wm. Myer, Wier-ton Steel Co.

Rockford: A "Father and Son" meeting was held May 4 at Forest Hills Country Club. The program included golf matches, an address on baseball by Sgt. Passarella, former major-league umpire, and colored motion pictures on fishing.

D. D. Burnside, now national president, presented charter to John Javorsky, chairman of Springfield, Ill., chapter at charter night ceremonies, March 18.



San Diego: Ernest Fincher, Westinghouse engineer, was technical speaker at the May 12 meeting. He spoke on "Electronics and Applications To Industrial Problems." The discussion included various recent applications of electronic devices as applied to the tool industry. Also on the program was showing of a film entitled "Electronics At Work", supplied by Westinghouse Electric and Manufacturing Co.

Seattle: The chief speaker at the April 11 meeting, held at Gowman Hotel, was Harold Mitchell, service unit engineer, for Boeing Aircraft Co. Mr. Mitchell, who has recently re-

turned from a year of duty in England, spoke for nearly two hours describing the actual wartime conditions in England and the attitude of the British people.

Springfield- (Ill.): Principal speaker at the May 2 meeting held in the Sun Room of the Leland Hotel, was C. B. Cole, president of Tool Equipment Sales Co. He talked on "Fundamental Principles of Tool Design for Mass Production."

Springfield-(Mass.): Coffee speaker at the May 9 meeting held in the High-

(Continued on page 210)

Columbia TOOL STEEL

ONE QUALITY—

The highest that can be produced.

... for all tools
... for all purposes

*It pays to use
Good Tool Steel.*

COLUMBIA TOOL STEEL COMPANY

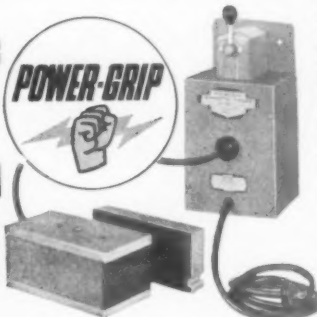
ARTHUR T. CLARAGE, PRESIDENT

GENERAL OFFICE AND WORKS

520 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

SHORT CUTS

WITH
**MAGNETIC
CHUCKS**
FOR
**TOOL ROOM
AND
PRODUCTION**



These illustrations show a few of the many grinding operations made possible by using Power Grip Magnetic Chucks. The small pieces illustrated have been ground true to the shoulder without extra jigs or fixtures by spacing the chuck and parallel.

110 Volts A. C. transformed and rectified through our efficient, enclosed, dry plate control Unit to 6 Volts D. C., which energizes the Magnetic Chuck. A safety against shocks and burn outs.

ROCKFORD MAGNETIC PRODUCTS CO.

1015 Sixth Ave. — Rockford, Ill.

CENTERING
DRILLING
REAMING
THREADING
TAPPING
SLOTTING
TAPER TURNING
COUNTERBORING
CHAMFERING

with
Wickman
**SWISS TYPE
AUTOMATICS**
and their various
attachments

**In addition to normal turn-
ing and forming operations**

The No. 2 Wickman machine illustrated is equipped with both three-spindle and slotting attachments. Three other attachments for drilling, threading and taper turning are also supplied for this machine. All Wickman attachments are easily interchangeable.

Do you manufacture parts which are in any way similar to those illustrated above—which require any of the operations listed? Are you interested in holding production runs of those parts to tolerances of $\pm .0005''$ or closer and securing finishes as fine as 25 micro-inches? If your answers to these two questions are in the

affirmative, Wickman Swiss Type Automatics have a place in your production.

Two Swiss Type Automatics are produced by Wickman. The No. 2 machine shown above has a $\frac{1}{2}''$ bar capacity and will handle pieces up to 4" long. The No. 1 machine has $\frac{5}{32}''$ bar capacity, maximum length capacity of $1 \frac{9}{16}''$.

LET US SEND YOU FULL INFORMATION

THE Wickman
CORPORATION

15535 WOODROW WILSON AVE.
DETROIT 3, MICHIGAN

land Hotel, was Edward C. Taylor, patent attorney, who talked on "Little-Known Facts About Patents."

The principal technical speaker was Arthur A. Schwartz of the Bell Aircraft Corp., who spoke on "New Production Methods." His talk covered induction heating, friction sawing, and high-speed milling.

South Bend: More than 100 members and guests attended the May 9 meeting held at the Indiana Club.

Principal speaker was Howard Pope, manager of service engineering, Cincinnati Milling Machine Co. He talked on "High Speed Milling With Carbide Cutters." His talk covered the theory and advantages of negative rake milling on steel at high speeds and fast feeds.

Mr. Pope stated that negative rake milling is an accepted practice, but that this type of machining requires substantially built machine tools and heavy body cutters and considerable retraining of machine operators.

St. Louis: Approximately 165 persons turned out to hear T. A. Hunt, manager, sales promotion department, Federal Products Corp., present an authentic color film showing the principles of close tolerance measurements by means of the dial indicator. The film also depicted actual scenes of the use of the dial indicator in mass production.

Syracuse: The annual dinner dance was held May 6 and was attended by

275 members and guests at the Hotel Syracuse.

At the May 9 meeting, H. Torn, of the V. & O. Press Co., spoke on "Presses Geared For Defense."

Toronto: The principal speaker at the April 14 meeting was Dr. H. A. Frommelt, research director of Kearney & Trecker Corp. He talked on "High Speed Milling with Negative Angles."

He pointed out specific examples of high-speed milling of high-speed steel, using cemented carbide tips with negative angles, demonstrating the definite increases in speeds and feeds effected. Also pointed out were trends to deep freezing of cutters and mechanical application of carbide tool tips by the wedge method. Considerable interest was shown in the discussion of high speed milling non-ferrous metals.

Tri-Cities: The coffee speaker at the May 1 meeting, held at the LeClaire Hotel, Moline, Illinois, was W. Z. Fidler of the Reynolds Engineering Co. He talked on "Puzzle Problems and Pocket Tricks."

Technical speaker was W. P. Powers, of U. S. Tool Co., Inc., who talked on "U. S. Multi-Slide Machines."

Twin-Cities: W. W. Kneff of the Aluminum Corporation of America showed a movie on machining and fabricating of aluminum at the April 26 meeting, held at the Covered Wagon in Minneapolis.

Also on the program was a short

talk by P. J. Hofstrom, writer and artist for the St. Paul Dispatch, and showing of a film entitled "Life and Death of the Aircraft Carrier Hornet."

At the technical session of the May 12 meeting, O. J. Lenmark showed a colored film on die casting. Following presentation of the film, Charles Y. Adams answered many questions and gave considerable information on the properties of different alloys used for various purposes.

Twin States: H. K. Reynolds, chief engineer of Fafnir Bearing Co., was technical speaker at the May 10 meeting held at the Masonic Temple, Springfield, Vt.

He talked on "Bearing Types and Their Applications," pointing out the tremendous variety of bearings which manufacturers have developed to fulfill the requirements of their customers and illustrating the many difficulties encountered by bearing designers in meeting all requirements and at the same time maintaining standards.

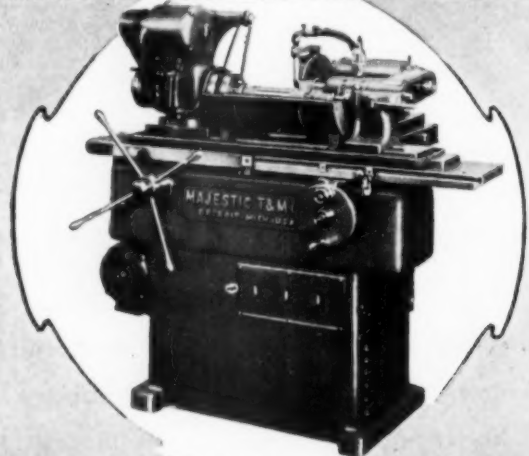
Also on the program was the showing of a film entitled "Better Tooling For Internal Grinding".

Wichita: Oscar N. Davis, of Cessna Aircraft Co., was principal speaker at the May 9 meeting.

Mr. Davis talked on "Jet Propulsion," using illustrations and models, and photographs, to illustrate the history and development of this means of locomotion. He set forth not only

(Concluded on page 212)

Simplified Grinding with PARKER-MAJESTIC Internal and External Grinders



For precision grinding... internal or external... Majestic simplicity of design and flexibility of changeover guarantee maximum grinding output at low cost.

Send for descriptive circular... NOW!

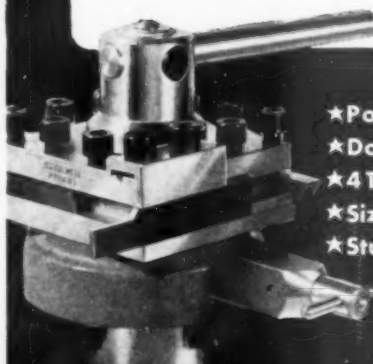
Representatives in all principal cities.



Majestic Tool & Mfg. Co.

2950 E. WOODBRIDGE • DETROIT 7, MICH.

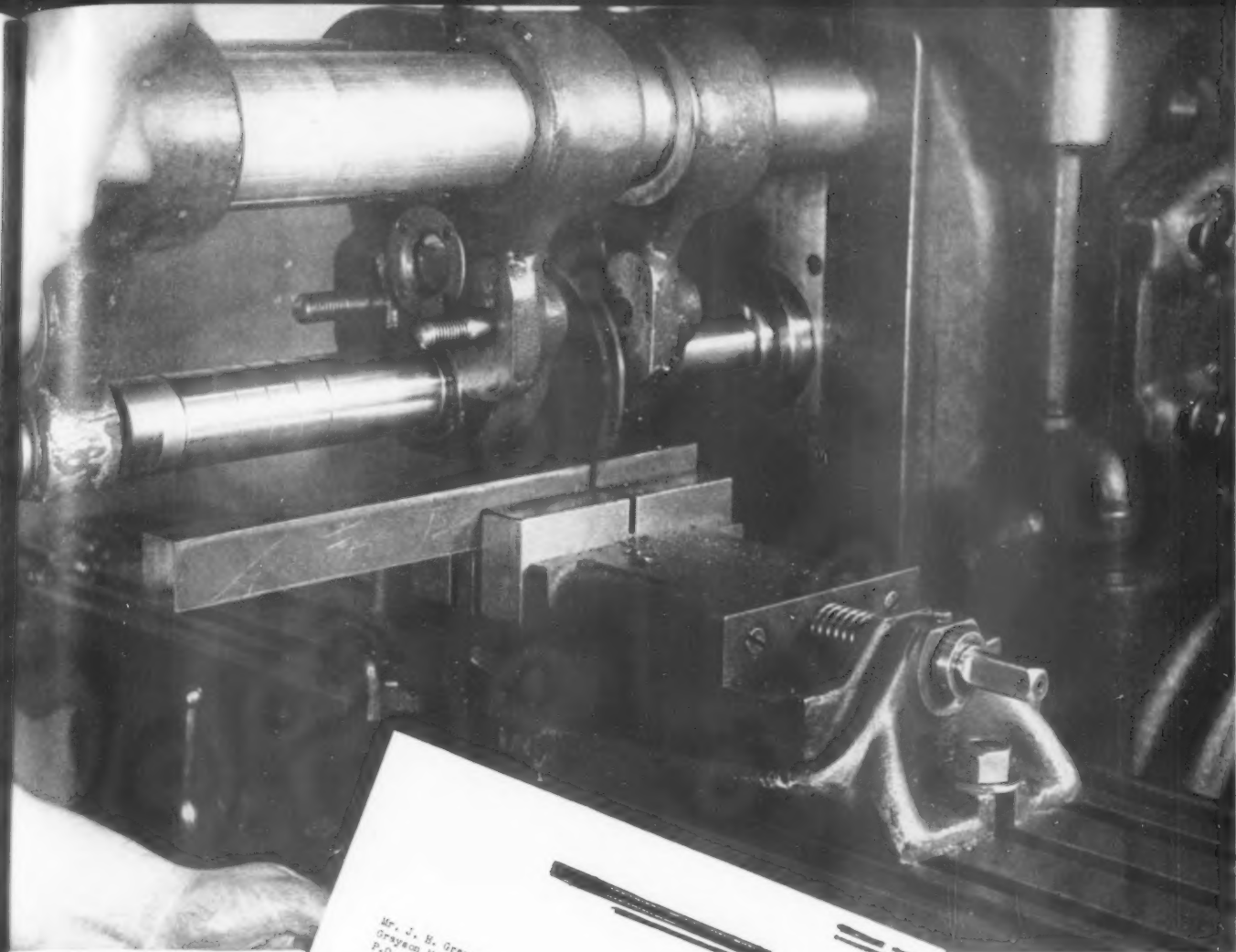
Get More Production from the Same Lathe... with Colwell Turrets.



- ★ Positive Indexing
- ★ Does Precision Work
- ★ 4 Tool Changes
- ★ Sizes for All Lathes
- ★ Sturdy Construction

Specify the Turret with
the Built-In Cutting-Off Tool

S. G. COLWELL
25 Congress Ave., Prov., R.I.



SLITTING 4130 AT 22" PER MINUTE



In addition to slitting saws, the Grayson Manufacturing Company also makes available to the trade a standard line of carbide milling cutters, in various types and sizes.

Mr. J. H. Grayson
Grayson Manufacturing Company
P.O. Box 88
Monrovia, California

September 30, 1943

Dear Mr. Grayson:

Your prompt delivery of carbide-tipped saws means hours of time saved in our shop as the following report will show:

Cutter	- 4 X 3/32 Saw
Material	- SAE 4130 Bar Stock
Speed	- 680 R.P.M.
Feed	- 22" per minute

In comparison to this the best performance we could get from a high speed steel saw was 120 R.P.M. at 3/4" feed. With a standard Grayson carbide-tipped saw we produced in 3 hours as many parts as had been previously cut off in 12 hours.

This production record proves that with your saws we can produce more work with fewer machines. Your carbide-tipped saws are the answer to our slotting and cutoff problems.

Yours truly,

J. H. Grayson
J. H. Grayson

CHB:mg

WITH A FEED RATE OF 22" PER MINUTE (as against a maximum performance of 3/4" per minute with high speed steel), this aircraft firm has been able to quadruple its production in cutting off tough 4130 bar stock. As the letter reproduced here indicates, this performance has increased the output per machine immensely, a vitally important fact in these times when machines and operators must be used to the utmost.

Standard Grayson carbide-tipped slitting saws are available for cutting steel, or cast iron and nonferrous metals. Excellent deliveries can be made on standard saws ranging from four to eight inches in diameter.

Grayson Manufacturing Company

CEMENTED CARBIDE CUTTERS

PATENTS PENDING

MONROVIA, CALIFORNIA

Backing EVERY Distributor — Offering Experience and Ability to Solve Many Metal Cutting Problems . . Is a Factory Trained **BARNES SERVICE ENGINEER**



... say **THE REASONER TOOL and SUPPLY CO.**
BARNES DISTRIBUTORS IN BOSTON, MASS.

Pictured above is Mr. E. A. Reasoner with his assistant, Mr. Everett F. Doucette. These two men are well known to hundreds of buyers of high grade cutting tools in Eastern Massachusetts, Maine, New Hampshire, and Vermont—and are typical of the leading Mill Supply Distributors who handle Barnes products throughout the country.

In commenting on the Barnes line which his company has handled for some time, Mr. Reasoner says: "We have found that the performance of Barnes Blades has resulted in thoroughly satisfied industrial acceptance."

Dependable cutting performance has been built into Barnes Blades for twenty-five years. It is available to you in the complete stocks of band saws and hack saw blades maintained by your Barnes Distributor. When your blade requirements must be met exactly, call him.

Have You Received



**YOUR BARNES
HACK SAW PRODUCTION
Calculator?**

This handy calculator quickly estimates the time required to cut any size or shape of metal stock. Write for yours—no charge or obligation.

W. O. BARNES CO., INC.

DETROIT 14, MICHIGAN

1919 - 1944

◊ TWENTY-FIFTH ANNIVERSARY ◊

— A. S. T. E. DOINGS —

the conventional principles but an advanced set of principles which he has developed. Seventy-eight members and guests attended the meeting.

Williamsport: Substituting for Mr. H. A. Frommelt, of Kearney & Tockler, who was unable to keep a speaking engagement, Mr. Cole of Continental Machines, Inc. was principal speaker at the May 8 meeting.

Mr. Cole talked on "Theory and Use of Gages, Optical Flats and Instruments." Also on the program was showing of a colored picture on motion study in reference to machines, tools, and time study. The meeting was the last one for the spring season. The next session will be held in September.

* * *

June Meetings

★

Atlanta: June 7, Tavern Tea Room. J. T. Thompson, public relations department, Continental Machines, Inc., will talk on "Precision Measurements."

Boston: June 17, Marlboro Country Club. Annual Outing.

Decatur: June 7, Decatur Pump Co. Club Rooms. Speaker will be John A. Markstrum, chief engineer, Continental Tools Works Division, Ex-Cell-O Corp. He will be assisted by George M. Burgess, also of Ex-Cell-O. Subject will be "Design, Operation, & Care of Broaches."

Fairfield County: June 7, Algonquin Club. The speaker will be M. Reid, tool supervisor, General Electric Co., Bridgeport Works, who will speak on "Jigs & Fixtures."

Fort Wayne: C. G. Marshall, Supervisor of Tools & Dies, S. F. Bowser Co., will lead an open discussion on tools and dies. L. A. Puggard, O. K. Machine Co., will talk on deep drawing dies.

Hamilton: June 17, Dundas Golf Club. Field Day.

Hartford: June 5, Ball Room, Hotel Bond. Speaker: Tell Berna, general manager, National Machine Tool Builders Ass'n.

Milwaukee: June 24, Pfister Hotel. Dinner dance.

Peoria: June 6, G. E. Platzer, Chrysler Corporation, will speak on "Powdered Metallurgy."

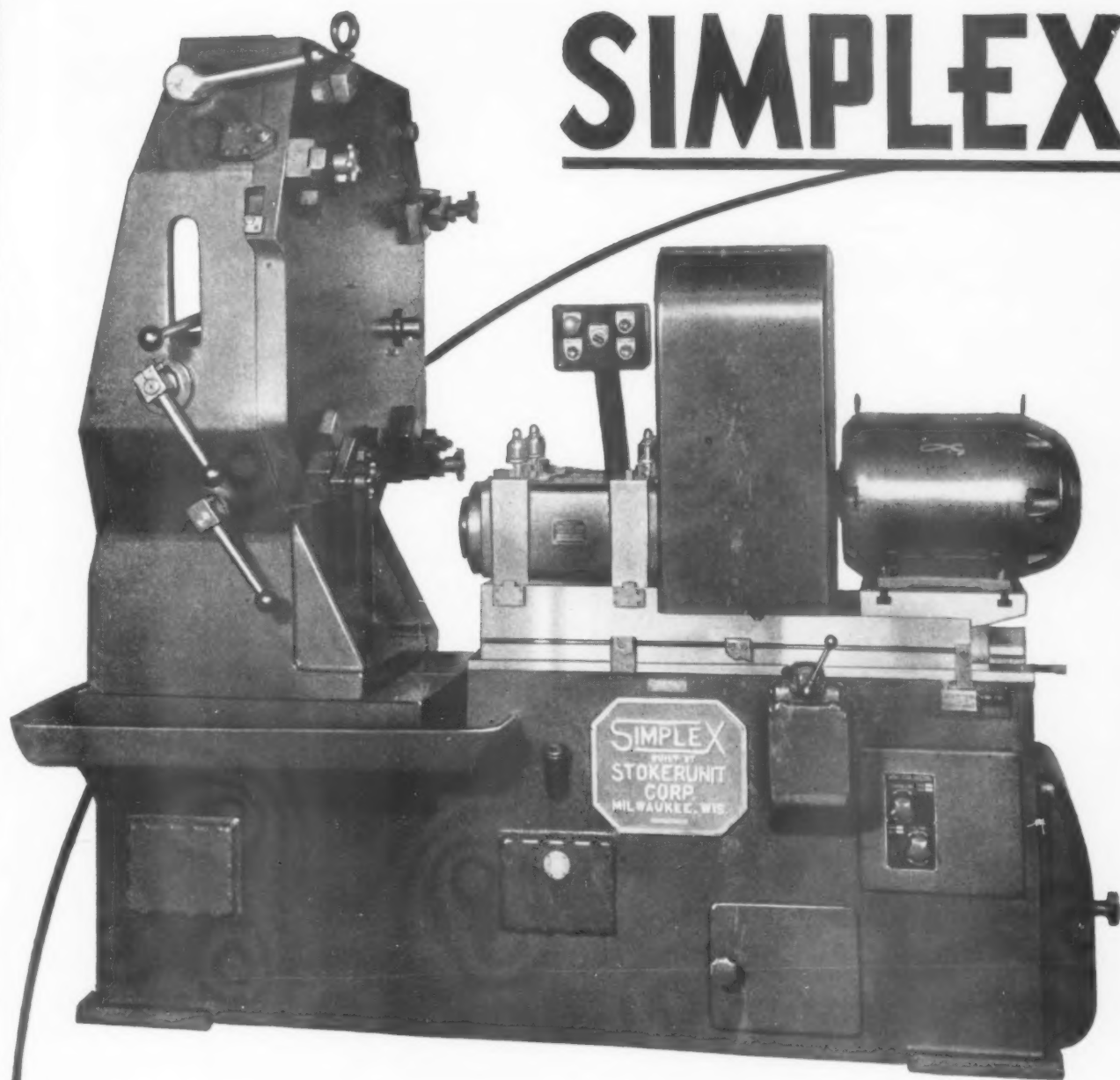
Racine: June 9, Meadowbrook Country Club. Annual Frolic.

South Bend: June 3, Elkhart Country Club. Picnic.

Springfield-(Ill.): June 6, Leland Hotel. H. Gotberg, chief engineer, Colonial Broach Co., will speak on "Modern Broaching Methods."

THE TOOL ENGINEER

SIMPLEX



— Precision Boring Machines

Did you know that precision boring has grown up? It is no longer confined to jobs you can carry around in your hat. Today pieces as large as your desk are being precision bored for military purposes. Tomorrow similar pieces will be precision bored for commercial purposes. Now is the time to be considering these applications in your own plant.

The machine shown above is one model. Other larger and more versatile units have been built and more are coming. Our catalogue will give you a more general picture. Our dealers will help answer your specific needs. Ask for our catalogues on your letterhead, without obligation. Our engineering surveys are available for your problems.

STOKERUNIT CORPORATION

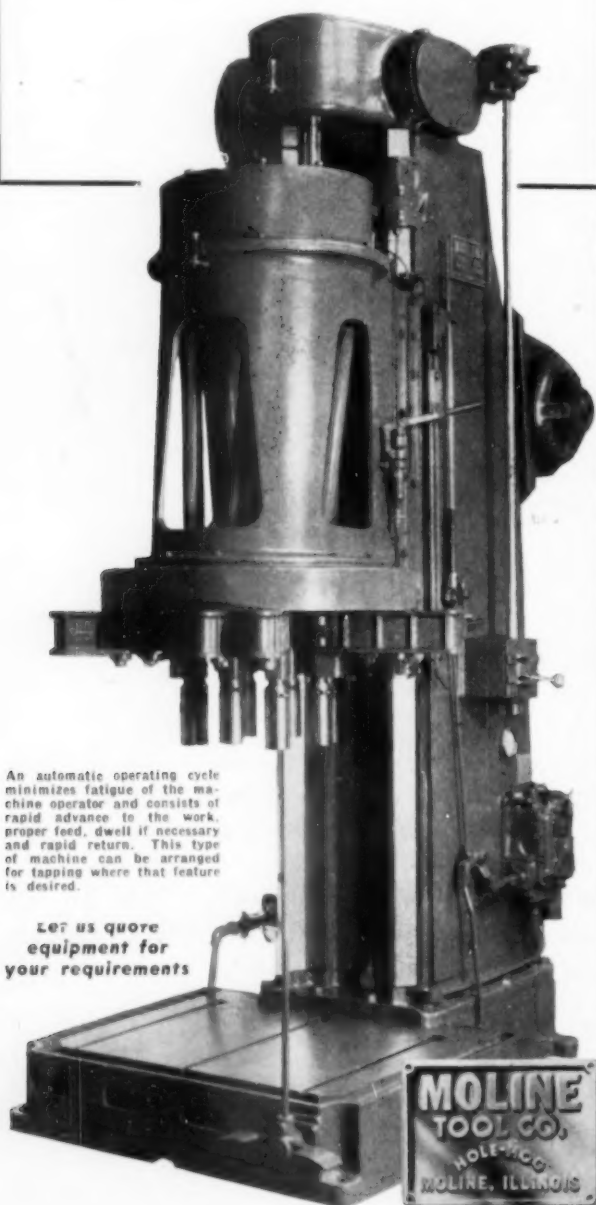
SIMPLEX Precision Boring Machines and Planer Type Milling Machines

4528 West Mitchell Street, Milwaukee 14, Wisconsin

Costs are reduced by High Production Drilling

The Moline No. 115-U Hydraulic, Rail-Feed Driller is a rugged, easy-to-operate, heavy duty production tool. The rated capacity of this machine is sixteen 5/8-inch holes in steel or sixteen 1 1/2-inch holes in cast iron.

The No. 115-U as regularly furnished has 16 spindle drivers built into the spindle head gear housing, although a greater or lesser number can be furnished if desired. Four speeds to all spindle drivers are instantly available through a gear shift lever, and superimposed on these four speeds is provision for individual adjustment of each spindle driver to either of two speeds or neutral. Each drill spindle is driven by a driver through two heavy universal joints and an extra long seamless steel driving tube which permits maximum adjustment of spindles with a minimum angular displacement and results in longer life of the universal joints. The drilling area covered by adjustment of the spindles as regularly furnished is 18-inch by 36-inch rectangular or 20-inch circular as desired. Other sizes can be supplied.



An automatic operating cycle minimizes fatigue of the machine operator and consists of rapid advance to the work, proper feed, dwell if necessary and rapid return. This type of machine can be arranged for tapping where that feature is desired.

Let us quote equipment for your requirements

SMOOTH PLANING WITHOUT CHATTER

**RED-E
STYLE K
Shaper Tool**



DESIGNED FOR SMOOTH WORK

Why use a lathe tool for a shaper when you can get a Red-E Shaper Tool that will take perfectly smooth, heavy cuts with absolutely no chatter?

This is a single-purpose tool with the old goose-neck principle. The cutting point is on the line of deflection and any springing of the tool it takes away from the work and not into it deeper.

Standard square High Speed Steel treated tool bits are used. Larger sizes made on order.

WRITE FOR CATALOG E-42

THE READY TOOL COMPANY

585 IRANISTAN AVE.

BRIDGEPORT

CONN.



... for Top Efficiency in Thread Grinding

STUART Thread Grinding Oils are in wide use, giving unequalled efficiency at nominal cost. Developed in co-operation with leading manufacturers of thread grinding machines and wheels, they have been proved in many of the largest and most modern metal working plants. . . . A Stuart Oil Engineer will gladly help you achieve top efficiency in thread grinding. Ask him to come in.



For All Cutting Fluid Problems

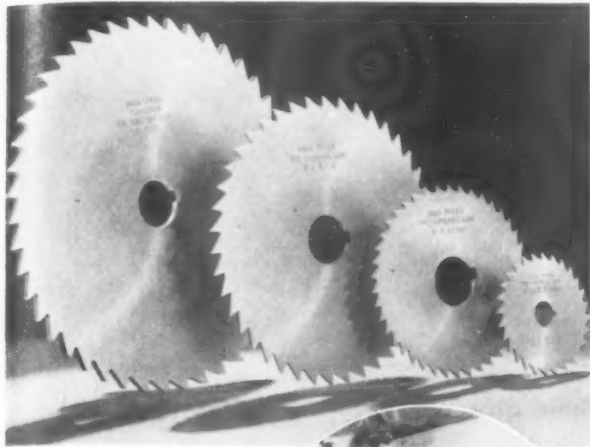
D. A. STUART OIL CO.

Chicago, U.S.A. • LIMITED • Est. 1865

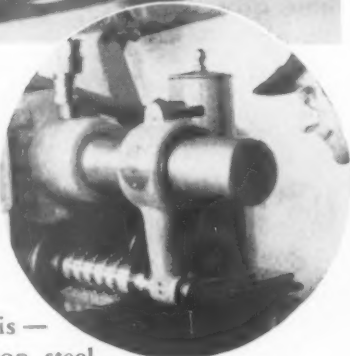
Warehouses in All Principal Metal Working Centers

THE TOOL ENGINEER

For Gang-Milling Jobs up to 150 Saws per Set-up



... Use SIMONDS Metal-Slitting SAWS



On jobs like this —
slitting high-carbon steel
sheets from $\frac{1}{16}$ " to $\frac{1}{4}$ " thick—Simonds Metal-
Slitting Saws cut with smoothness and ac-
curacy that eliminate extra operations often
needed. And in addition to metal-slitting, the
high-speed steel saws are used in many other
applications using up to 150 saws in the set-up.

Simonds Carbon and High-Speed Metal-
Slitting Saws are made from Simonds steel of
uniform grain size and structure for longest
cutting life. Tolerances are rigidly held, to
assure correct slot-widths and spacings. And
each saw is radially ground for lump-free
clearance in operation. Order from your dealer
or from the nearest

Simonds office...

Branch Offices:

1350 Columbia Rd., Boston 27,
Mass.; 127 S. Green St., Chicago
7, Ill.; 228 First Ave., San Fran-
cisco 5, Cal.; 311 S. W. First Ave.,
Portland 4, Ore.; 520 First Ave.
So., Seattle 4, Wash.; 31 W.
Trent Ave., Spokane 8, Wash.

BUY BONDS



SIMONDS

SAW AND STEEL COMPANY

FITCHBURG, MASSACHUSETTS

PRODUCTION TOOLS FOR CUTTING METAL,
WOOD, PAPER, PLASTICS

JUNE, 1944

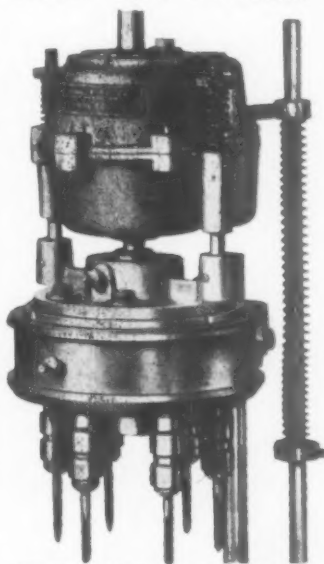
Question: What's the
HIGHEST PRODUCTION
Method of Tapping
or Drilling?

Answer: THE *Ettco-Emrick*
SYSTEM OF MULTIPLE
SPINDLE TAPPING AND
DRILLING HEADS

Reason:

Because the Ettco-Emrick System pro-
vides both the **method** and the
equipment essential to obtaining
highest production on parts in which
two or more holes must be tapped or
drilled.

HOW THE SYSTEM WORKS



Typical Ettco-Emrick Multiple
Tapping Head with central driv-
ing and automatic reversing
mechanism.

1. From a drawing or sample
of the part, Ettco-Emrick en-
gineers first determine the
method of handling and feed-
ing the part which permits
tapping or drilling all re-
quired holes **simultaneously**
in one or more of the parts.

2. The Ettco - Emrick high
speed multiple spindle tap-
ping or drilling head is then
made up entirely of standard
stock parts arranged to carry
out the method. Heads can
be used on any drill press or
tapping machine. Quill
Clamp, supplied with each
head, assures rigidity needed
for high precision.

3. A drawing is made of the
fixture needed to set up and
feed the parts fast and ac-
curately for the tapping or
drilling operations. This draw-
ing goes with the head or we
will build the fixture to your
order.

RANGE OF THE SYSTEM

Drilling—Wire sizes to $\frac{1}{2}$ " inclusive.

Tapping—Machine screw sizes to 5/16" inclusive.

FOR FULL DETAILS

Write for BULLETIN No. 3. Your copy will be mailed
promptly on request.

ETTCO TOOL CO.

586 Johnson Ave., Brooklyn 6, N. Y.

Detroit 1

Chicago 6

OVER 25 YEARS SPECIALIZATION IN DESIGNING AND BUILDING
DRILLING AND TAPPING EQUIPMENT

The
Famous
Ettco-Emrick DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

• THE PASSING PARADE •

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

THE EVER-CHANGING SCENE IN MASS MANUFACTURING

Dr. Laurence C. Hicks has been appointed metallurgical engineer and associate director of research in the Magnetic Products Division of Allegheny-Ludlum Steel Corp.

A member of the company's research department since 1933, Dr. Hicks is stationed at the company's research laboratories at Breckenridge, Penn. He has been conducting research on materials for the electrical industry since 1936.



Dr. L. C. Hicks



R. H. Thielemann

R. H. Thielemann has been appointed development engineer, it also has been announced by the Corporation. Author of several technical papers on

metallurgy, he formerly was associated with General Electric Co. Before joining the G. E. organization he was an engineer for the Bethlehem Steel Corp. at its Pacific Coast plants.

Alexander S. Basil has been named assistant manager of the Lowell, Mass., plant for the United States Rubber Co.

Starting with the company as process engineer in 1926, Mr. Basil had served as chief wire inspector and technical superintendent until being transferred to the company's general offices in New York City.

Anthony A. Aponick, formerly affiliated with Brown Instrument Co., in a service engineering capacity, was appointed service engineer in the Buffalo territory for Park Chemical Co.

Joseph F. Gaffney has been appointed district manager for H. K. Porter Co., Inc. at Rochester, N. Y. The service and engineering office will serve northern New York State. Other district managers announced by the company are R. W. Steves, who will head an office in Cincinnati, serving major portions of Ohio, Kentucky, West Virginia and Indiana; and W.

T. Campbell, Philadelphia engineer who has been appointed manager for the district office at Philadelphia, covering Western New Jersey, Eastern Pennsylvania, and Delaware.

J. L. Cunningham has been appointed field service engineer for the company to service Northern New Jersey. His headquarters are at Newark.

James F. Reid, former deputy chief of the Alloy Steel Branch of the War Production Board, has been appointed production manager of the Timken Roller Bearing Co.

Before obtaining a leave of absence in May, 1942, to join WPB in the Alloy Steel Section, he had been production manager of the steel and tube division.

P. J. Potter, superintendent of Federal Mogul Corporation's Detroit foundries for five years, has been appointed production metals engineer for the company. His duties will include supervision of all metal production and fabrication operations. He has been associated with the research and production departments for 21 years.

(Continued on page 218)



Made To Fit Any Machine

Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.

Prevent **Oversize and Bell-Mouthed Holes!**

To prevent oversize and bell-mouthed holes in tapping and reaming is no longer difficult—because, in most cases, the trouble is not the fault of the machine or the tool but is caused by the spindle not being properly aligned with the work.

This can be easily remedied by using a different type of tool holder. Change over to a Ziegler Floating Tool Holder—the type that automatically compensates for inaccuracies in spindle alignment up to 1/32"—and see what a difference it will make in the precision of the work performed.

No other tool holder has the floating action of the Ziegler. Never any friction or cramping, no matter how heavy the load! No wonder it turns out work accurately to the finest of tolerances! Try it and see.



W. M. Ziegler Tool Co.
1920 Twelfth St.
Detroit 16, Mich.

FLOATING HOLDER
for Taps and Reamers...

WRITE FOR CATALOG



THREE Simplimatics ONE Operator

THIS is typical of what you'll see wherever Gisholt Simplimatics enter the production picture . . . an amazing volume of machining work, done swiftly and easily.

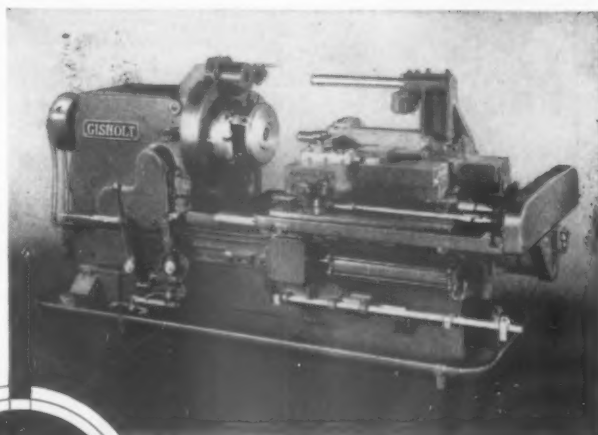
That's the story of the Simplimatic in a nutshell—a completely automatic cycle of machining operations set in motion with one simple control. That's what makes it possible for one person (with very little training) to tend several machines.

In today's war production, Gisholt Simplimatics are doing much to relieve the shortage of skilled hands. If you have parts to machine in large quantities, investigate them now.

GISHOLT MACHINE COMPANY

1229 East Washington Ave., Madison, Wisconsin

Look Ahead—Keep Ahead—With Gisholt



GISHOLT SIMPLIMATICS are built in both Platen and Radial types. Both permit multiple cutting with accuracy at high cutting speeds. Write for complete information about them.

Arthur J. Miller, has been elected president of the Chicago Wheel & Mfg. Co. to succeed his father, the late **Henry E. Miller**, who founded the company in 1894.

The new president joined the company in the special formula department in 1915. He is credited with being responsible for many developments, including industrial-type mounted wheels, high-speed electric grinders, and various processes widely used throughout the abrasive industry.



A. J. Miller



J. H. Marks

James H. Marks, associated with the Packard Motor Car Co. for 28 years has been named executive vice-president of the company.

Joining the Packard organization in 1916, he had been successively production manager, industrial engineer, and purchasing manager and has been a vice-president since 1940. He has been active in handling Packard's contractual relations with the Government on war production and recently was ap-

pointed chairman on the Contract Termination Committee of the Automotive Council for War Production.

Lincoln E. Walker, for the past six months assistant general manager of Murchey Machine and Tool Co. has been appointed general manager in charge of all the company's activities. He succeeds **A. J. Prance**, president, who has been general manager of the company since 1912 and who has been forced by ill health to free himself of direct responsibility. He will continue as president and a director.

Gordon G. Johnson, formerly acting plant manager, has been promoted to plant manager of Lycoming Division of The Aviation Corporation in Williamsport, Penn. He formerly had been controller of the corporation and also served as assistant treasurer until March 1942.

Prior to his association with the Aviation Corporation, he was connected with the Auburn Automobile Company in various executive capacities and was its president during 1937 and 1938.

Otto W. Winter, formerly associated with Sav-Way Industries, has been appointed vice-president of the Acme Pattern and Machine Company of Buffalo, New York.

During the interim between his present connection and his tenure at Sav-Way, he was associated with Consulting Engineering Service of Detroit.

Prior to his connection with Sav-

Way, Mr. Winter was associated with Republic Drill & Tool Co.; Columbus McKinnon Chain-Chisholm Moore Hoist Corporation; Kent-Owen Machine Co.; Whitman and Barnes, Inc.; and Cincinnati Milling and Grinding Machines, Inc.

He is a member and past national president of The American Society of Tool Engineers, and a member of American Society of Mechanical Engineers, American Society for Metals, American Welding Society, and Society of American Military Engineers.



O. W. Winter



Harry Fink

Harry Fink, formerly chief tool engineer for American Tool Engineering Co., has joined the LaSalle Designing Co. His new activities consist of acting as liaison man in charge of all contact work and outside engineering.

Edward N. Haas, has been appointed works manager of the Aurora, Ill. (Continued on page 224)

ATTENTION DIE MAKERS!

PRODUCTO Master & Standard DIE SETS

delivered promptly

Whether your need is in the East or the West, we can give you complete, quick service on Producto equipment. Producto Die Sets are made in a wide variety of designs to meet the exacting demands of present day high production. There is one to fit exactly the die construction best suited to your stamping needs.

Write for Catalog No. 9
THE PRODUCTO MACHINE CO.
 990 Housatonic, Bridgeport 1, Conn.

The Producto Machine Company—3017 Medbury Avenue, Detroit 11, Michigan
 The Producto Company, Inc.—139 West 16th Street, Indianapolis 2, Indiana
 Die Supply Company—4747 Hough Avenue, Cleveland, 3, Ohio
 Jamison Steel Corporation—2168 E. Olympic Boulevard, Los Angeles 21, California

DISTRIBUTORS OF DICKERMAN AUTOMATIC PRESS FEEDS

THE NEWFIELD UNIVERSAL FLY-CUTTER

"STRADDLE MILLING"

ELIMINATES GRINDING

OF EXPENSIVE SPECIAL CUTTERS

ADVANTAGES

For:
 Fly Cutting
 Slotting
 Flat Surfaces
 Straddle Milling
 Gear Cutting

These versatile tools have been used successfully in gear cutting and hobbing. Any type of bit can be inserted and adjusted quickly. Complicated cuts are broken down into simple units by grinding each bit for a portion of the job. The Newfield fits all standard arbors, turns on any required speed, and is made in 4, 6, 8, and 10" sizes. The 10" size provides six tool positions. Special sizes upon application.

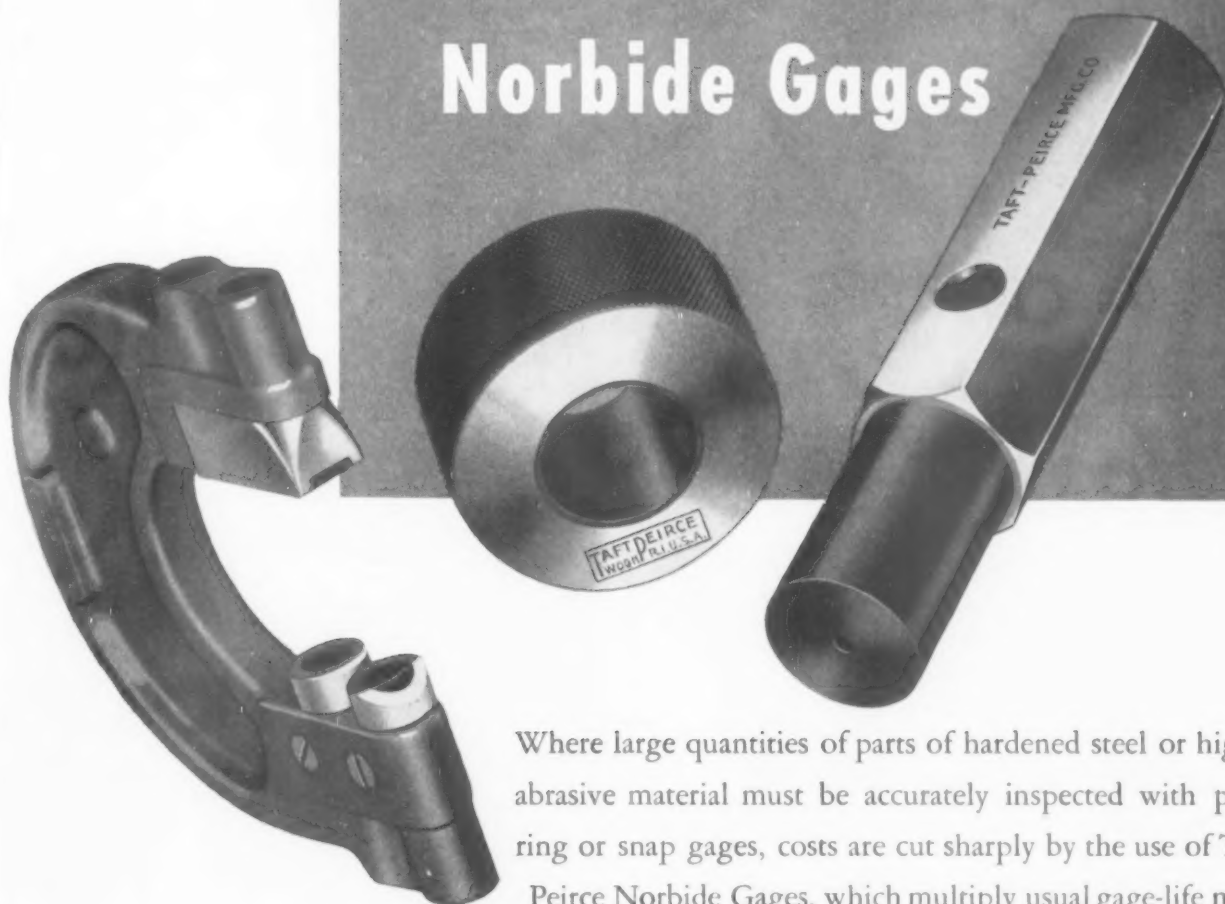
Write for Complete Details

NEWFIELD MACHINE PARTS CO.
 7160 MELROSE AVE. LOS ANGELES 46, CALIF.

FOR *Extra* RESISTANCE
TO ABRASION AND SCRATCHING

TAFT-PEIRCE

Norbide Gages



Where large quantities of parts of hardened steel or highly abrasive material must be accurately inspected with plug, ring or snap gages, costs are cut sharply by the use of Taft-Peirce Norbide Gages, which multiply usual gage-life many times. Norbide is extremely hard, has exceptional resistance to abrasion and scratching. Send your specifications to Taft-Peirce, and Taft-Peirce will send *you* quotations on Norbide plain plug and ring gages, snap gages, and certain types of special gages.

THE TAFT-PEIRCE MANUFACTURING COMPANY

WOONSOCKET  RHODE ISLAND

UNIVERSAL CENTERING CHUCKS



Universal Centering Chucks quickly convert any medium-sized drill press into a centering tool. Work from screw machines that has been centered on one end can be set on the press and rapidly centered on the other. A feed adjustment regulates the depth of the center so that concentricity and uniform depth of centers are maintained.

A convenient arrangement is provided for quickly removing the center drill and guide bushings. Write for further facts.



UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN



Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action...

that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience... Standard standards with Morse taper control in stock.

We will see that your job is set up with the right LIVE CENTERS—prompt deliveries on high priorities.

**STURDIMATIC
TOOL COMPANY**
5218 THIRD AVE. DETROIT, MICH.

WHAT DO YOU
NEED IN SPECIAL
CUTTING TOOLS?



ACCURACY?

Every order is carefully work-planned to your blueprints—and each operation painstakingly machined—even to 1/10,000 of an inch.

EXTRA CUTTING LIFE?

Cutting teeth or flutes scientifically designed for longest cutting life—plus correct scientific heat treating—give added useful life.

FAST DELIVERY?

Long experience, special facilities and "Know How" permit semi-production speed—even on specials.



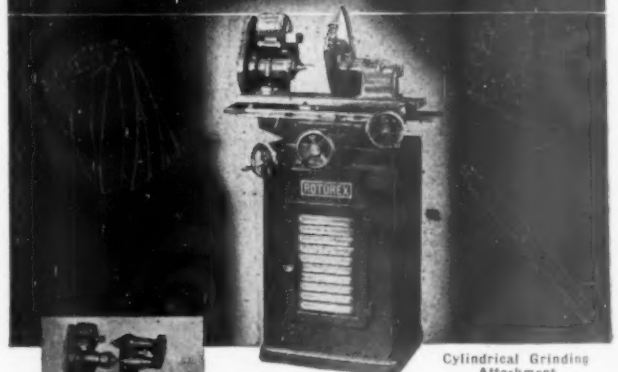
A.C.E.

**SPECIAL
CUTTING TOOLS**

Send for bulletin

American Cutter & Engineering Corp.
31751 Mound Road Warren, Mich.

ROTOREX UNIVERSAL GRINDER



Cylindrical Grinding Attachment



Internal Grinding Attachment



Sharpening a Helical Cutter

FOR SHARPENING AND PRODUCTION

PRECISION BUILT to perform two jobs — Production work such as cylindrical and internal grinding and sharpening of all kinds of tools.

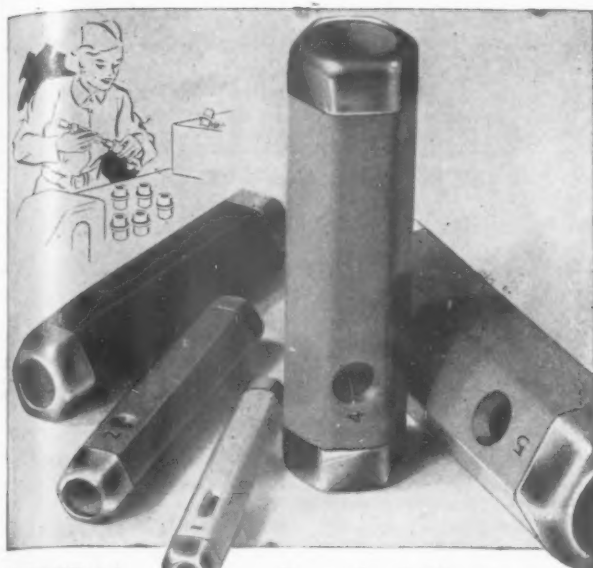
The keynote of the Rotorex is simplicity, accuracy and flexibility.

Compact and simple in design with a minimum number of working parts in conjunction with conveniently located controls.

Precision built for sustained accuracy because of good workmanship.

The variety of work it handles is attained by a wide range of attachments for faster set-ups. Selective speed range from 3000 to 6000 RPM.

DOUGLAS MACHINERY CO., Inc.
158 BROADWAY - NEW YORK, N.Y.



FEDERAL Taperlock Plastic GAGE HANDLES

Federal Plastic Gage Handles give gages a more sensitive touch because they are lighter than any metal. They reduce fatigue and insulate from body heat, safe-guarding accuracy. **Marked** for identification with the same stamps used for marking metal handles. **Ideal** for Glass Gages which require Handles of light weight for best results, reducing danger of breakage as well as adding to sensitivity. **Available** in seven standard sizes and in **colors**—Red, Yellow, Green and Black for easy identification. **New** low prices represent a real saving. **Now** available for smaller gages—size 00 in same colors.

IMMEDIATE SHIPMENT

FEDERAL TOOL CORPORATION
402 North Leavitt St. CHICAGO 12, ILLINOIS

*Variable
Speed*
**SPEED
LATHES**
for
**PRECISE
LAPPING
OF
GAGES**



Ideal
**FOR
FINAL
FINISHING
OPERATIONS**

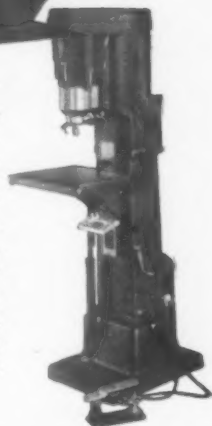
Speeds as low as 20 r.p.m., for accurate lapping of gages, and as high as 4,000 r.p.m., (with ample power for rotating heavy work), for de-burring, polishing, filing, etc., are available in these foot-operated speed lathes. Speeds are infinitely variable. Write for Catalog 440.

SCHAUER MACHINE COMPANY

ORIGINATORS OF TODAY'S SPEED LATHES
2066 READING ROAD . . . CINCINNATI 2, OHIO



Insure continuous, trouble-free tapping production The HASKINS Way, combining Haskins AIR CONTROL with the right fixture. Add Piece Part Control and you approach completely automatic tapping. Placing the part in the fixture actuates a micro-switch—AIR does the rest. Each piece is tapped uniformly, precisely—faster than by any other method. For complete information on high speed tapping The Haskins Way, send for our latest catalog, R. G. Haskins Co., 2756 W. Flournoy St., Chicago, Ill.



haskins

PRECISION TAPPING EQUIPMENT

*Here's
a Pump that's
"Ambidextrous"*

TUTHILL

**Automatic Reversing Pump
Delivers From Same Port
Regardless of Direction of
Shaft Rotation.**



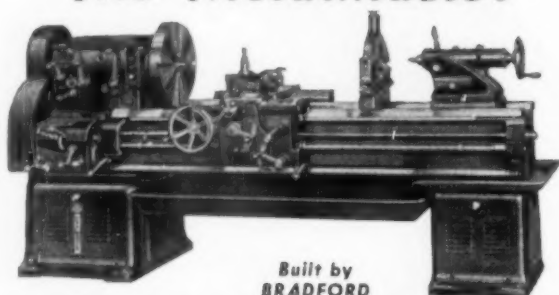
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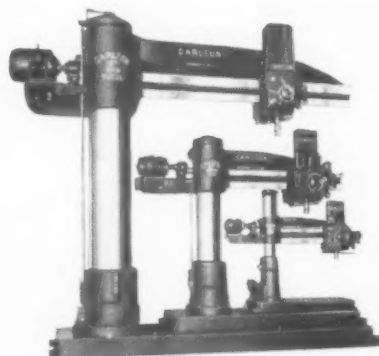
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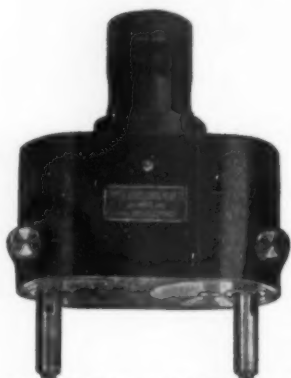
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plant of Independent Pneumatic Tool Co. He succeeds W. H. Brewer who has been named general factory manager. John P. Bank foreman of the training department for the past two years, has been named assistant works manager to succeed Mr. Haas.

Fred H. Haggerson, formerly vice-president and director, has been elected president of the Union Carbide and Carbon Corporation. He succeeds Benjamin O'Shea, who now is chairman of the board of directors.

★ Deaths ★

Walter Eugene Becker, southern regional manager of the York Corporation, died in Houston, Texas, April 10. He was 57 years old.

Mr. Becker had been associated with the York Corporation and affiliates for the past 38 years. He was a member of The American Society of Refrigeration Engineers.

Thomas B. Hogben, manager of New York office of the L. S. Starrett Co., died April 16, according to a company announcement.

Mr. Hogben had been associated with the company's New York office for 35 years and was widely known throughout the trade. He has been connected with the company's New York office for many years.

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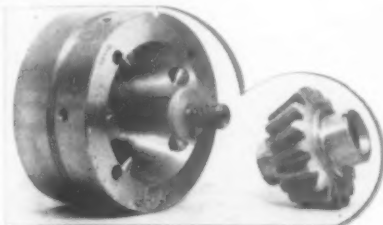
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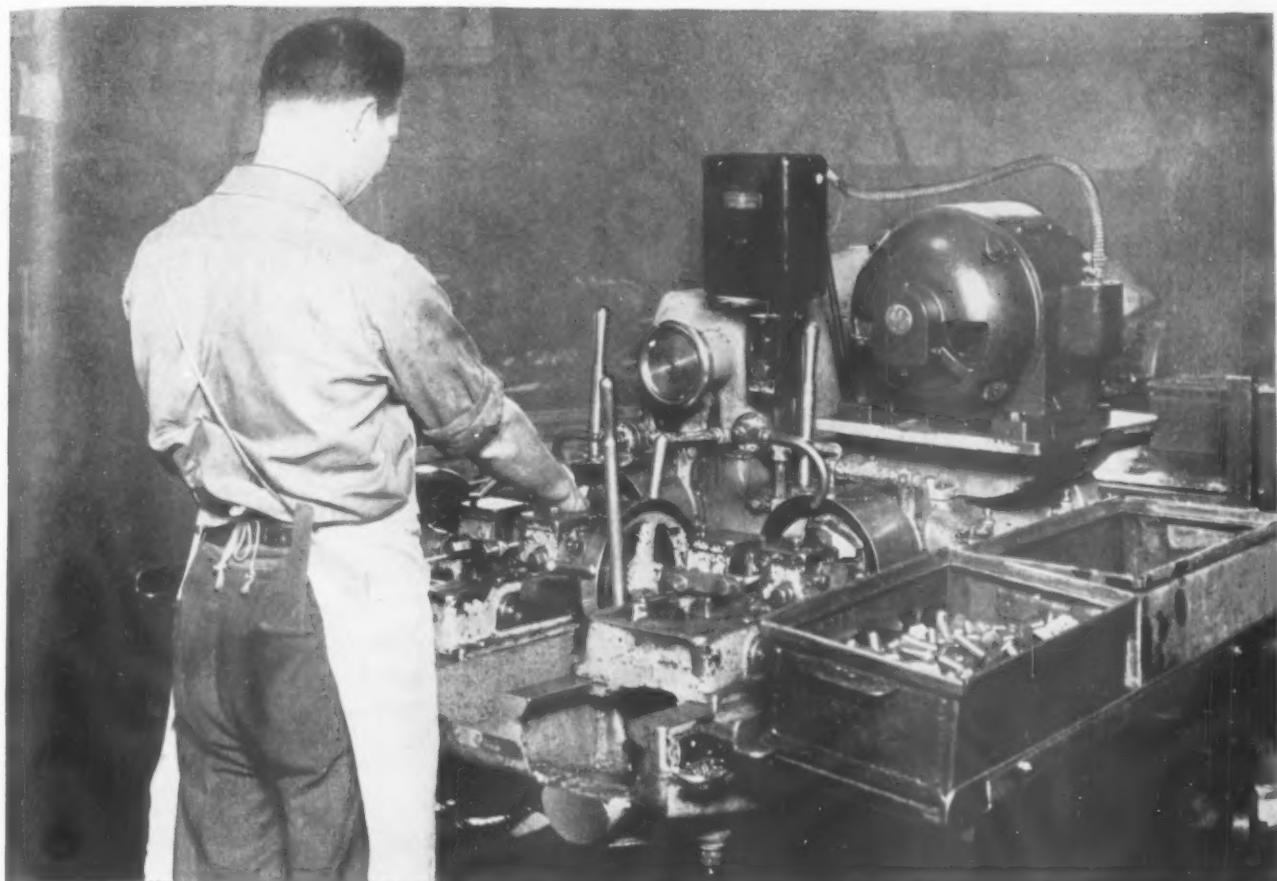
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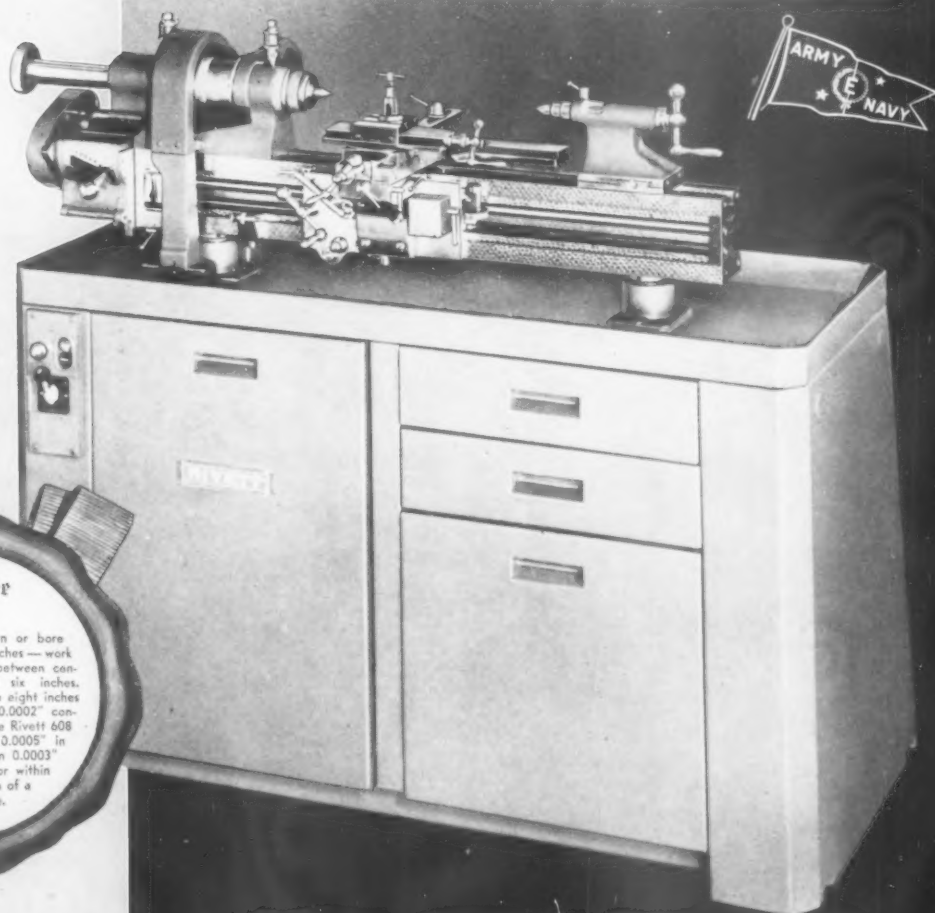
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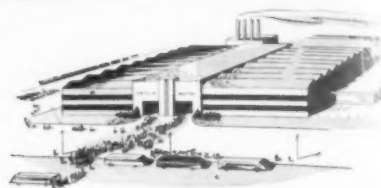


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Project: A scheme

Plan: A method of action

Today, progress is being made on two plans. The first is the "V" Plan. The second is the Post War Plan. Its success is vital to the peace at home after the victory abroad.

The "V" Plan is unified; the Post War Plan is not. Each country, community, association, company and certain individuals has its own. With so much effort from so many sources being exerted in the one direction, however, post war planning bids fair to achieve some of its objectives. For example:

The National Association of Manufacturers (14 West 49th St., New York City 20) has developed several guide books on post war planning. One of the objectives discussed in the first booklet is: "Seek to Reduce Costs." In substance it suggests that manufacturing, sales and operating costs should be reviewed to enable a corporation to operate profitably in a highly competitive economy.

Have you given real thought to retooling for the "peacework" future? New LeBlond lathes do two jobs as one, better and faster . . . they turn a profit as they true your product. Your resolve to retool is our time to serve.

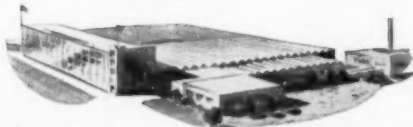
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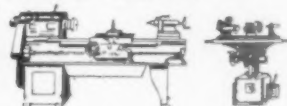
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FOR ILLUSTRATED SPECIFICATIONS:

- ☐ HEAVY DUTY GEARED HEAD ENGINE LATHES
- ☐ TOOL ROOM LATHES
- ☐ AUTOMATIC LATHES
- ☐ HEAVY DUTY GEARED HEAD GAP LATHES
- ☐ SUPER REGAL GEARED HEAD LATHES
- ☐ RAPID PRODUCTION LATHES
- ☐ AUTOMATIC CRANKSHAFT LATHES
- ☐ No. 2 CUTTER GRINDER

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